

## CWA 106 Water Quality Assessment Report

### Narrative

July 1, 2017 – June 30, 2018

1. **Name of Tribe:** Bear River Band of Rohnerville Rancheria (BRBRR)
2. **Project Period Used for Water Quality Assessment:**
  - a. July 1, 2017 – June 30, 2018
3. **Purpose of your Water Quality Monitoring Program:**
  - a. The purpose of the Tribal Water Quality Program is to: 1) determine the potential impacts of Tribal activities, including urban and stormwater runoff, construction, and upstream impacts from neighboring lands, and 2) determine the physical, chemical, and biological conditions of the surface and groundwater resources of the BRBRR to evaluate them against the water quality objectives defined in the Bear River Band of Rohnerville Rancheria Tribal Water Quality Objectives and Water Quality Standards. These standards were approved as part of the BRBRR Water Quality Ordinance and implemented in our Quality Assurance Program Plan (QAPP). The data gathered as part of the water quality assessment are used to: 1) develop a database of baseline water quality measurements used for the Tribe's water quality standards 2) determine the health of the wetlands, and 3) inform needs for remediation actions, best management practices (BMPs), or low impact development (LID) projects. Along with these purposes, the goals of the BRBRR Water Quality Monitoring Program are to: 1) determine how surface water quality is changing over time, 2) ensure the wetlands function as a natural filter for point and non-point source pollutants, 3) maintain water quality for the Tribe's drinking water, habitat to the local wildlife, aesthetic values to the Tribe and BRBRR's neighbors, and 4) ensure Tribal Members can harvest food and cultural materials.
    - i. The Water Quality Monitoring Program allows BRBRR to identify and monitor possible contaminants to the water source and take appropriate action to restore the quality of the water.
    - ii. The Tribe has tribally-adopted water quality standards on the monitored water bodies as stated above in Narrative 3a. These water quality standards are approved with the 2018 QAPP revision, but will be updated in the 2019 fiscal year.
4. **Collaboration or coordination with other groups addressing water quality concerns:**
  - a. During the current FY 2019 the Water Quality Specialist, ENR Director, and former Rancheria Executive Director have been working collaboratively to update the 2005 Water Quality Ordinance. This ordinance update is underway and will be completed in FY 2019.
  - b. During the FY 2018, BRBRR worked with Natural Resources Management Corp. to update the Quality Assurance Program Plan (QAPP) for the water quality programs. The protocol was updated to include new sampling equipment and procedures as well as reduce the number of sampling sites and reduce the frequency of sampling events.
  - c. During FY 2018, BRBRR and ENR staff collaborated with the Humboldt Resource Conservation District under the USFWS Tribal Wildlife grant to provide installation and maintenance support on a riparian planting component of the larger Salt River Ecosystem Restoration Project.
  - d. ENR Director, Edwin Smith, and Water Quality Specialist, Emily Moloney, both participate in the North Coast Resource Partnership (NCRP) and are members of the North Coast Tribal Water Consortium. Edwin serves as a Tribal Representative for the Central District Policy Review Panel (PRP), while Emily serves as Edwin's alternate. This group joins to review and provide input on environmental and water related policies and projects in the North Coast region.
5. **Design of your Water Quality Monitoring Program:**
  - a. The Tribe continues to employ a non-random, judgmental data collection methodology to collect samples under the:
    - i. Water Quality Monitoring Program, whereby the Tribal Environmental Staff selects sites for monitoring based on the following criteria:

1. Where water quality impairment is believed most likely to occur, including surface waters in the vicinity of community wastewater systems, individual homesteads, roadways, surface erosion sites, agricultural operations, construction sites, and identified past industrial operations;
2. During “first flush” and peak flow events when water quality impairment is believed most likely to occur;
3. Where protection of water quality is most critical, including the drinking water system and the groundwater source supplying that system; and
4. Where protection of water quality is of importance to the maintenance of identified wildlife habitat, for example, the wetland and riparian areas of the BRBRR.

b. Approach for determining sample sites and sampling frequency



Wetland and Stormwater Sampling Locations

BRBRR 2018  
Data Source: BRBRR ENR Department  
Imagery: USDA 2016 NAIP

- Wetland sites
- Stormwater sites
- Streams
- Wetlands



0 250 500 1,000 Feet

- i. Staff collects surface water samples twice per month as long as the water is flowing. Because our streams are ephemeral, we can only sample during the rainy season when water is present in the channel. WS3 is the only sample site that holds water all year, while WS 1, and 6 dry up seasonally. Biweekly monitoring allows the ability to track changes, if any, in the water quality, while keeping to a tight grant funded budget.
- ii. Samples are taken by collecting water and filling bottles to be sent to a lab and tested for specified parameters while others parameters are tested directly from the water using a Eureka Manta 2.0 multprobe. Direct observations are recorded into a field notebook and saved as a screenshot on a handheld device for redundancy before being entered into a tribal database.
- iii. Stormwater samples are taken within the first 30 minutes of discharge when possible for all qualifying storm events during the rainy season.
- iv. Locations selected for sampling:

1. WS1 – This location is in an unnamed stream known to the ENR department as west fork of eastern creek due to its location being in the eastern part of the Rancheria parcels. The sampling site is approximately 2,500 feet upstream of the confluence. The site is easily accessible by foot and was chosen to help evaluate the health of this stream.
2. WS3 – This sampling site is located where stormwater runoff enters a wetland from a culvert located under Singley Road and down from a drop inlet that drains the casino parking lot. This location is downstream of the casino parking lot and was selected to determine the water quality from the uppermost part of this sub basin known here as middle creek. This site gives us a snapshot of water quality before it flows through the wetland complex.
3. WS 6 – This sampling site is located at the downstream most site of the middle creek wetland complex which flows west off the Rancheria toward the Eel River. This sample site was chosen to help determine changes to water quality as water flows through the wetland complex and off the Rancheria.
4. SS2 – This sampling site is located on Singly Rd. at the outflow of a former wetland area now converted to the casino parking lot. The site is just upstream of a culvert that drains the water to the middle creek wetland area that flows west through the Rancheria. This site was chosen in order to monitor first flush stormwater draining from the casino parking lot.
5. SS4 – This sampling site is located on Carroll Rd. where a storm drain enters a wetland area known as MA4. This site was chosen in order to monitor first flush stormwater that drains the Carroll Road section of Tish Non Village.
6. SS6 – This sampling site is located on Keisner Road between the Recreation Center and the, mid-construction, Family Entertainment Center. This sampling site was chosen in order to monitor the first flush stormwater runoff flowing from the Tish Non Community Center, Recreation Center, and Family Entertainment Center.

**6. How water quality data is interpreted and managed:**

- a. Our lab support comes from North Coast Laboratories in Arcata, CA.
  - i. Sample bottles are labeled with date, time, sample site, and parameter to be tested. The samples are delivered to the lab the same day of collection with a Chain of Custody indicating the samples and tests requested.
  - ii. The samples are analyzed at North Coast Labs and the lab reports are emailed to the Water Quality Specialist (WQS) and Environmental Director.
- b. Data Organization
  - i. Direct observations and lab results are imported into an Excel spreadsheet that is WQX compatible. This data is uploaded monthly into EPA's WQX online database.
- c. Emily Moloney, WQS, is responsible for the organization and interpretation of results.
  - i. Water quality data input into the tribal database is done ASAP, while results are uploaded to the WQX monthly.
  - ii. The WQS analyzes the data annually for each sample site and parameter to determine if the annual averages fall within the baseline criteria for the Tribe's adopted water quality standards. The WQS compares current data against past data to determine how water quality is changing. Additionally, results are read as they are received allowing for continuous observation of water quality.
  - iii. Designated QA/QC of data is managed through the contracted laboratory's standard operating procedures. Additionally, data is entered manually as frequently as possible and in small batches to allow each entry to be reviewed for accuracy. QA/QC program requirements are outlined in the 2018 QAPP.

## 7. Results of water quality monitoring during this Project Period:

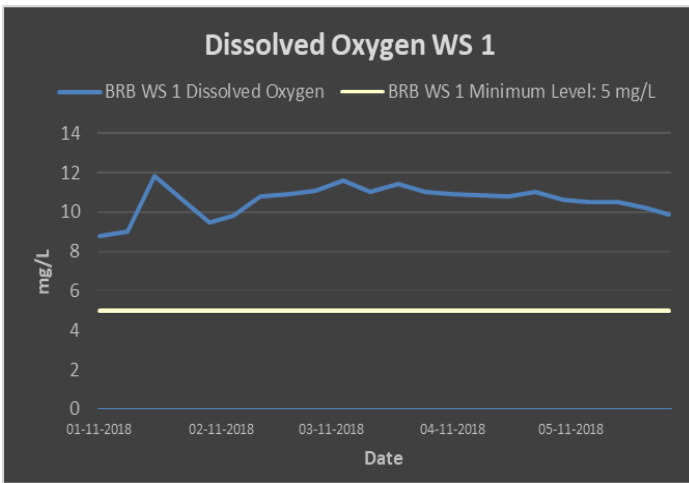


Figure 1. Dissolved Oxygen Levels at WS 1 from January 2018 to June 2018.

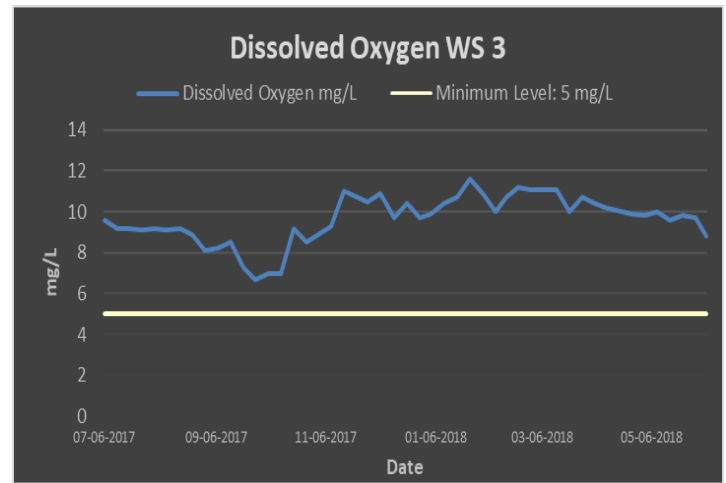


Figure 2. Dissolved Oxygen Levels at WS 3 from July 2017 to June 2018.

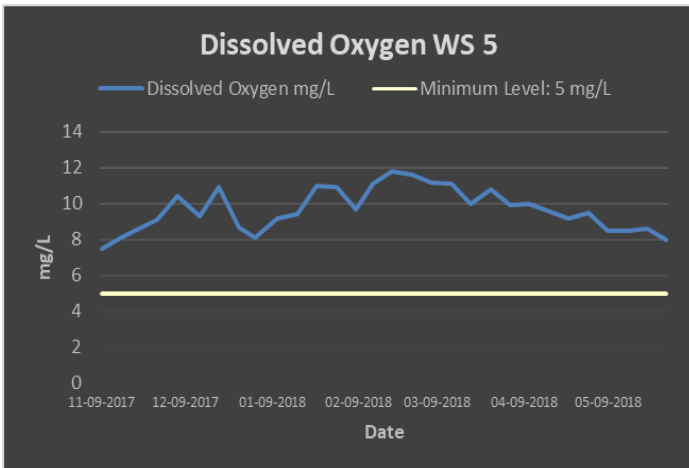


Figure 3. Dissolved Oxygen Levels at WS 5 from November 2017 to May 2018.

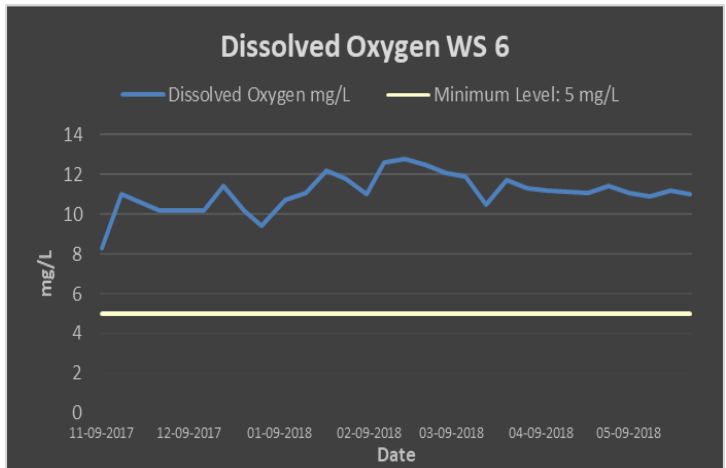


Figure 4. Dissolved Oxygen Levels at WS 6 from November 2017 to May 2018.

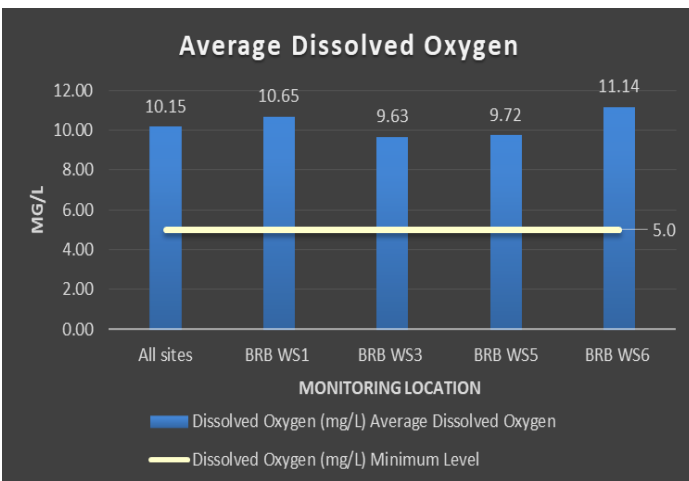


Figure 5. Average Dissolved Oxygen Levels at all sites in FY 2018.

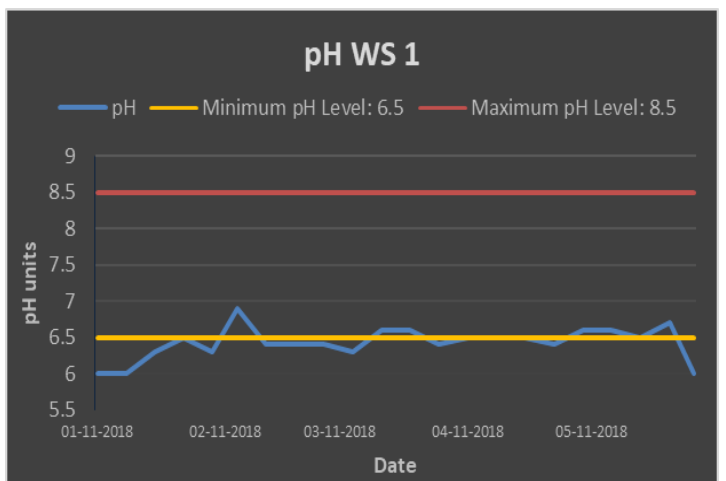


Figure 6. pH levels at WS 1 from January 2018 to June 2018.

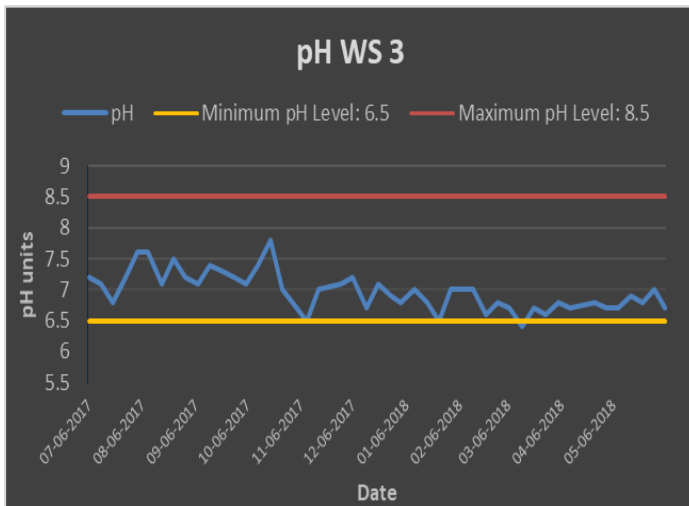


Figure 7. pH levels at WS 3 from July 2017 to June 2018.

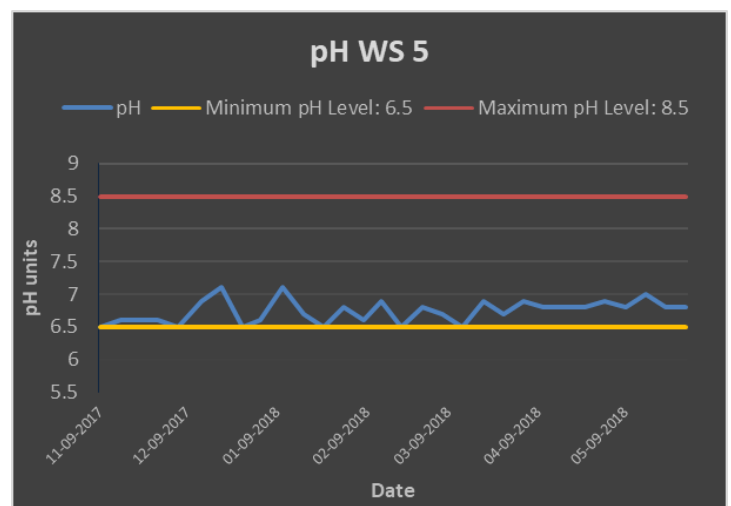


Figure 8. pH levels at WS 5 from November 2017 to May 2018.

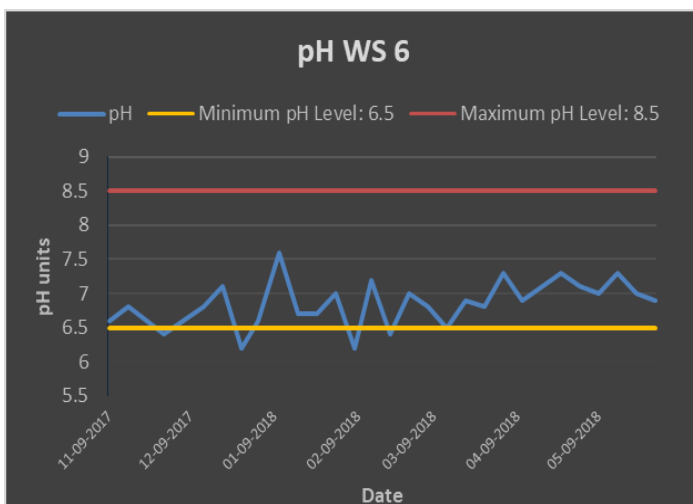


Figure 9. pH levels at WS 6 from November 2017 to May 2018.

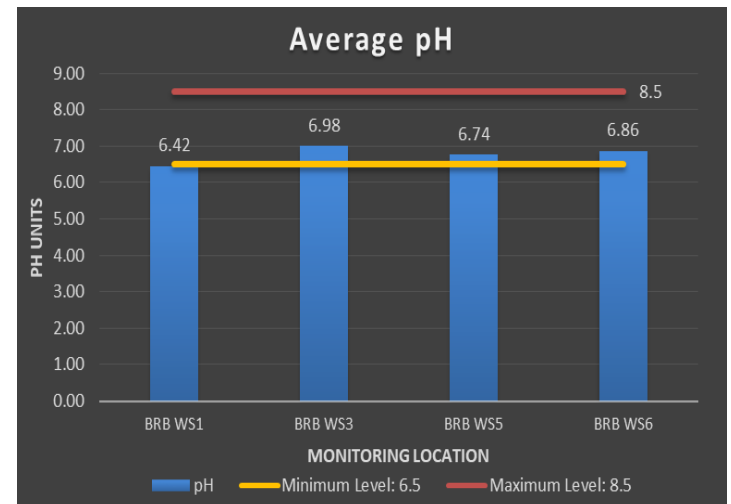


Figure 10. Average pH levels for all sites in FY 2018.

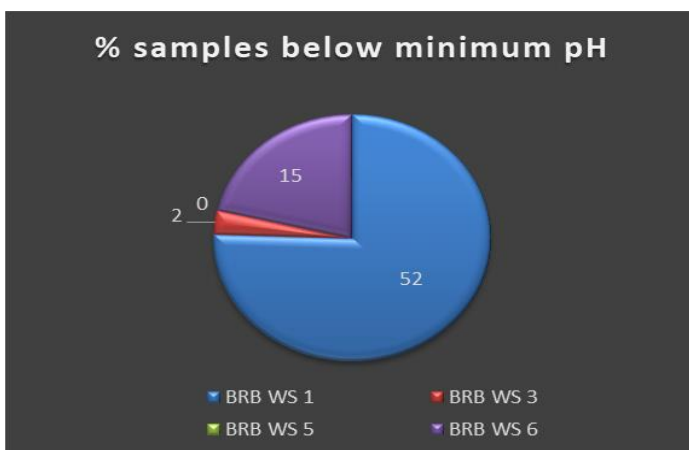


Figure 11. Percent of samples that were below the minimum pH threshold for FY 2018.

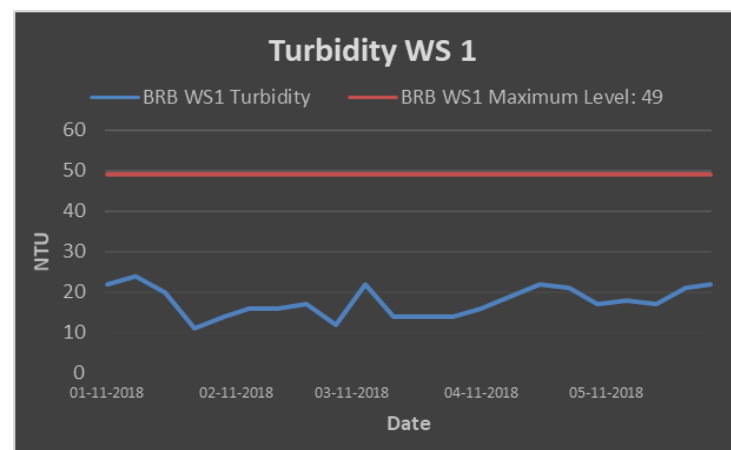


Figure 12. Turbidity levels at WS 1 from January 2018 to June 2018.

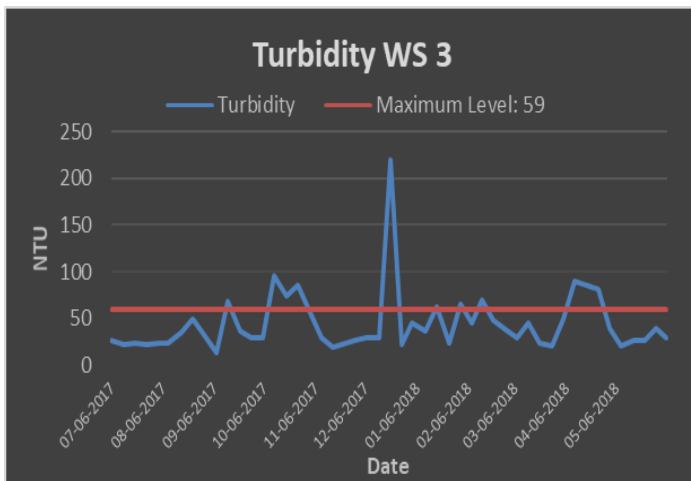


Figure 13. Turbidity levels at WS 3 from July 2017 to June 2018.

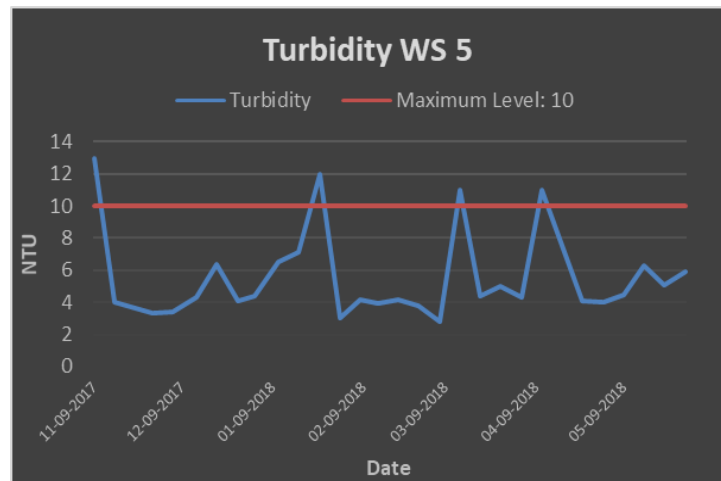


Figure 14. Turbidity levels at WS 5 from November 2017 to May 2018.

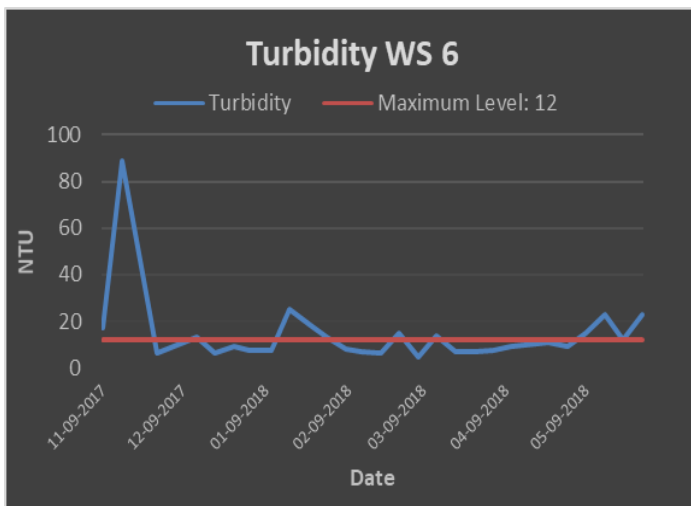


Figure 15. Turbidity levels at WS 6 from November 2017 to May 2018.

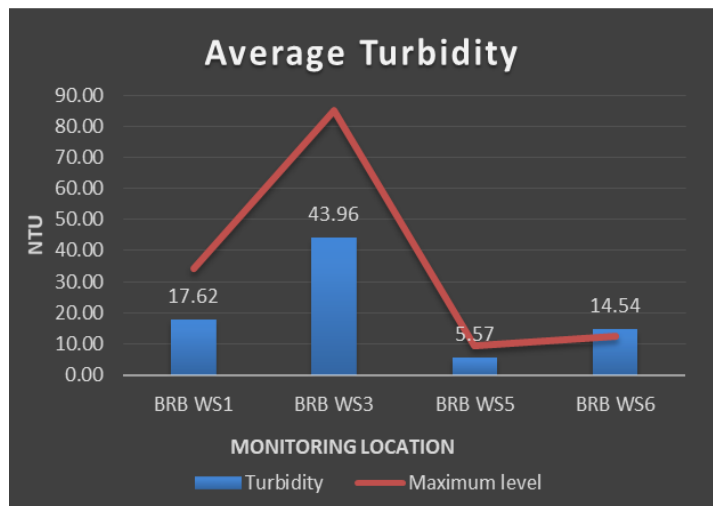


Figure 16. Average Turbidity levels at all sites in FY 2018.

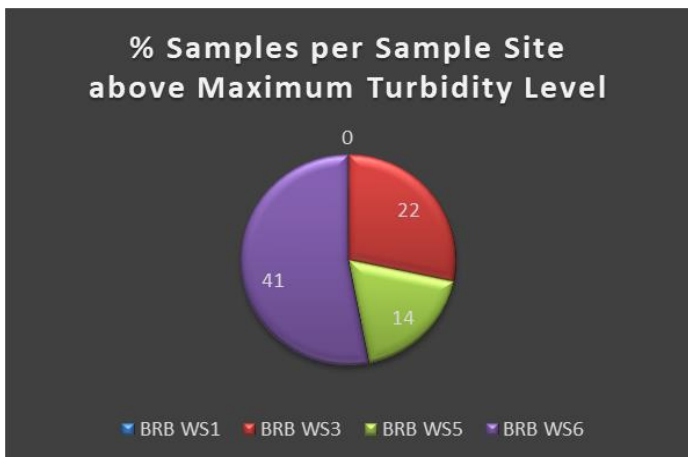


Figure 17. Percentage of samples per sample site that had results above the maximum level for turbidity.

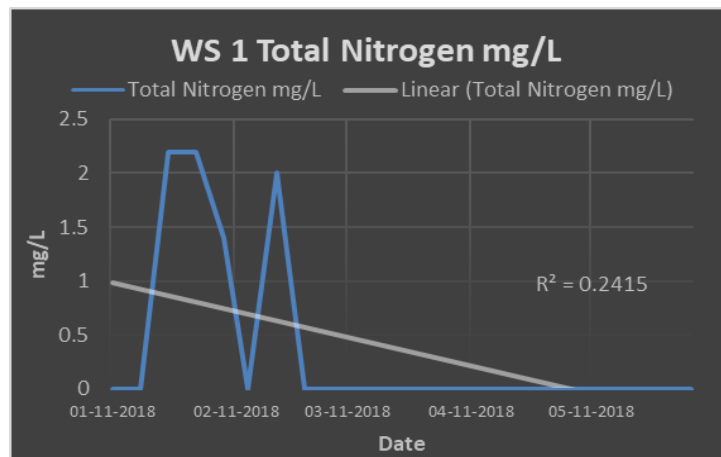


Figure 18. Total Nitrogen levels at WS 1 from January 2018 to June 2018.

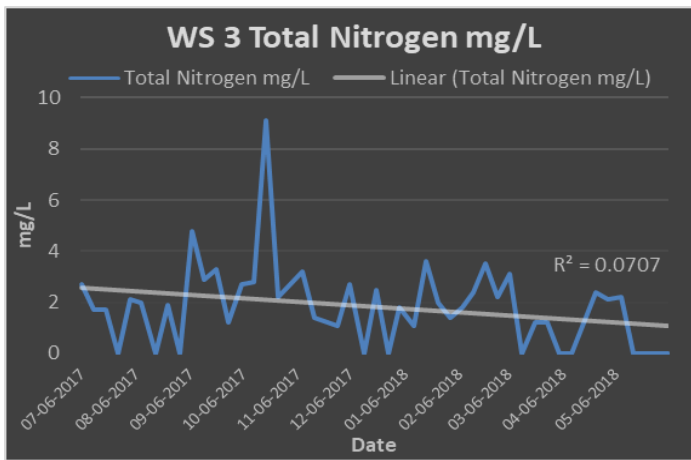


Figure 19. Total Nitrogen levels at WS 3 from July 2017 to June 2018.

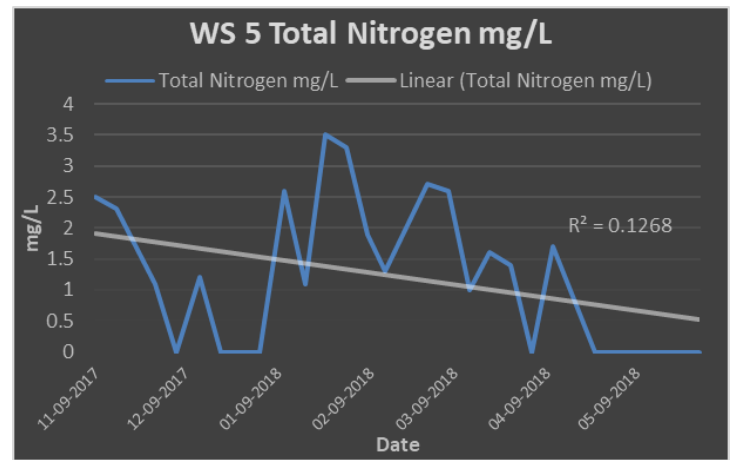


Figure 20. Total Nitrogen levels at WS 5 from November 2017 to May 2018.

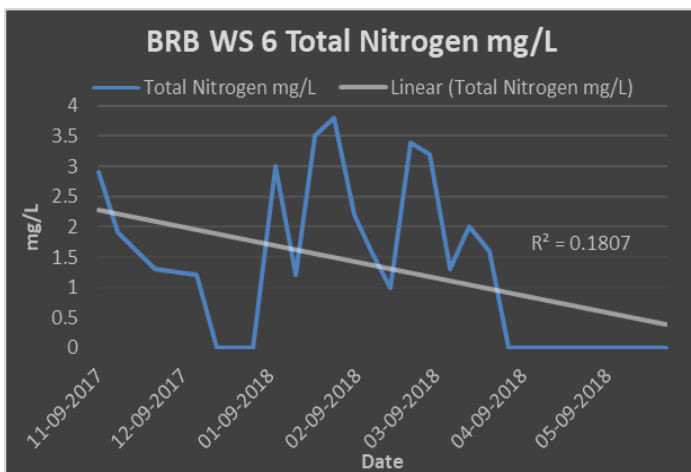


Figure 21. Total Nitrogen levels at WS 6 from November 2017 to May 2018.

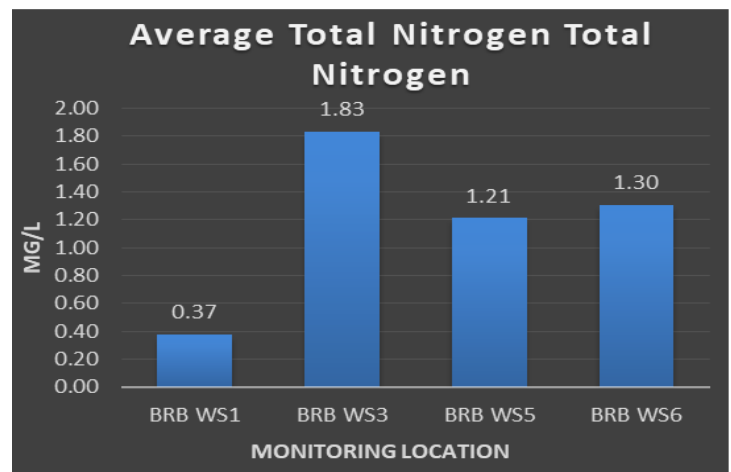


Figure 22. Average Total Nitrogen at all sample sites in FY 2018.

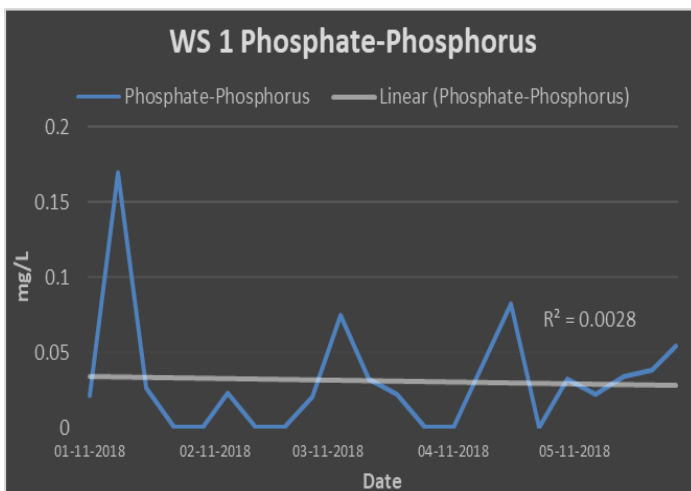


Figure 23. Phosphate-phosphorous levels at WS 1 from January 2018 to June 2018.

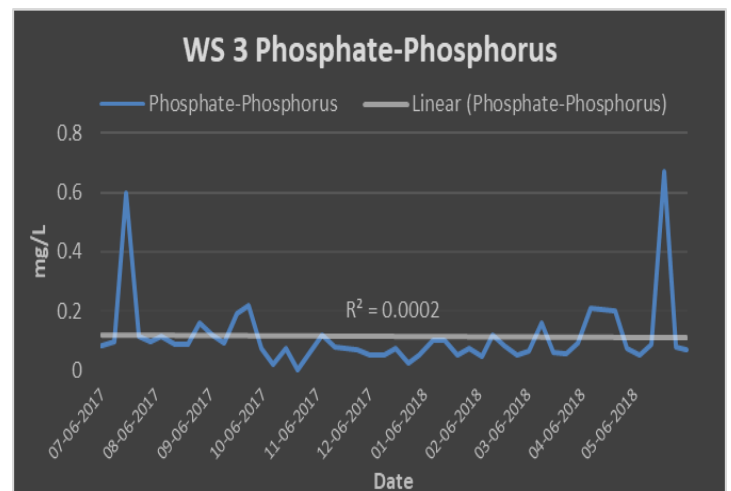


Figure 24. Phosphate-phosphorous levels at WS 3 from July 2017 to June 2018.

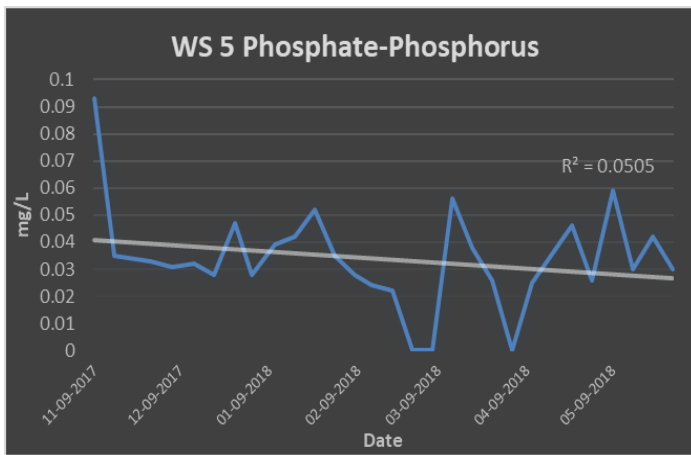


Figure 25. Phosphate-phosphorous levels at WS 5 from November 2017 to May 2018.

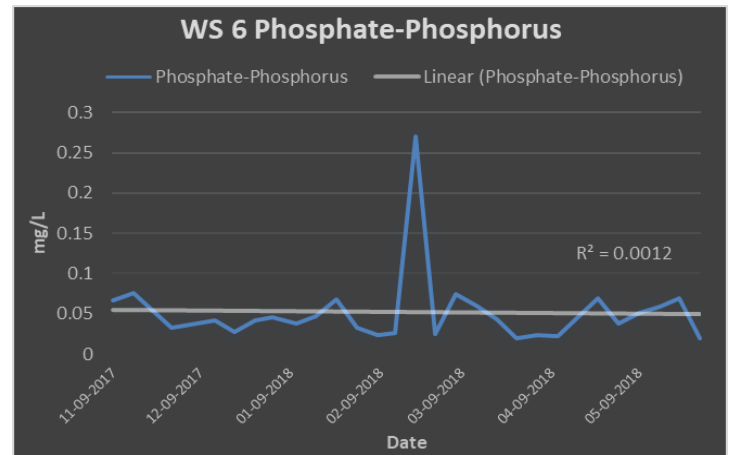


Figure 26. Phosphate-phosphorous levels at WS 6 from November 2017 to May 2018.

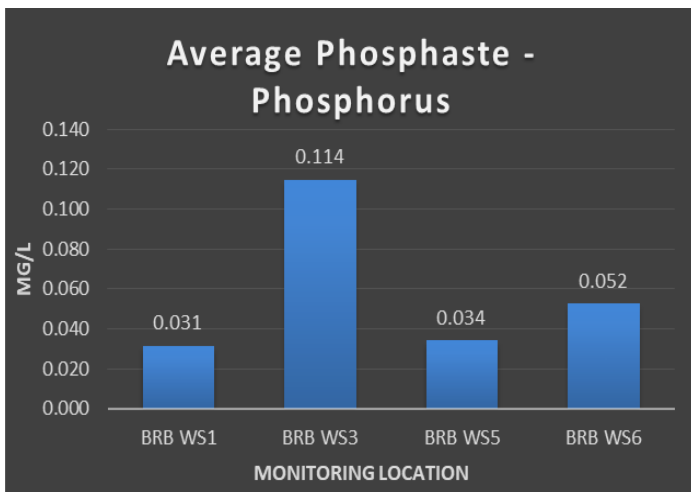


Figure 27. Average Phosphate-phosphorous at all samples sites in FY 2018.

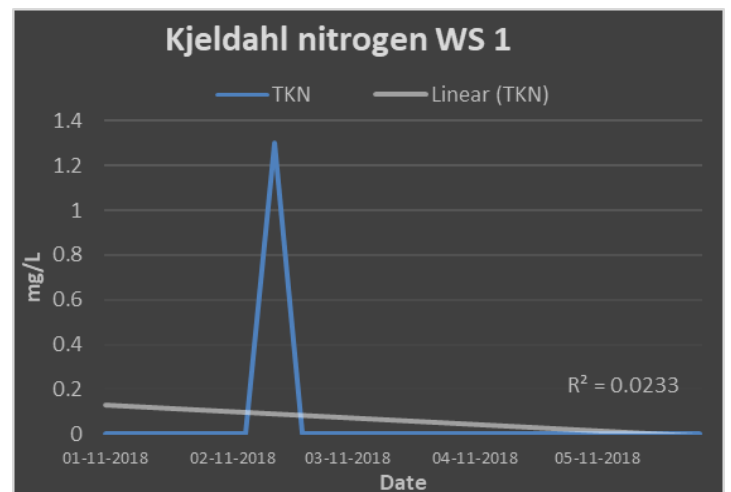


Figure 28. Kjeldahl nitrogen levels at WS 1 from January 2018 to June 2018.

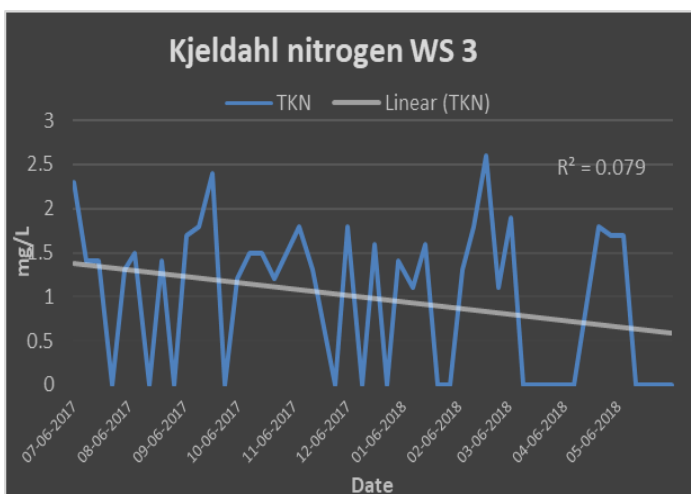


Figure 29. Kjeldahl nitrogen levels at WS 3 from July 2017 to June 2018.

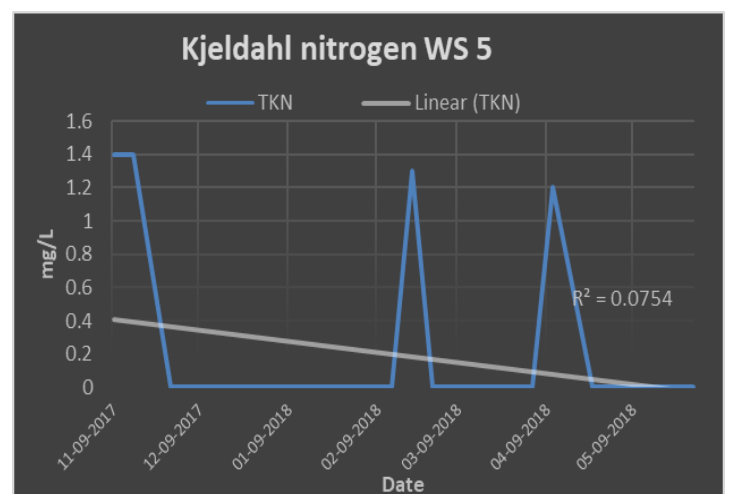


Figure 30. Kjeldahl nitrogen levels at WS 5 from November 2017 to May 2018.

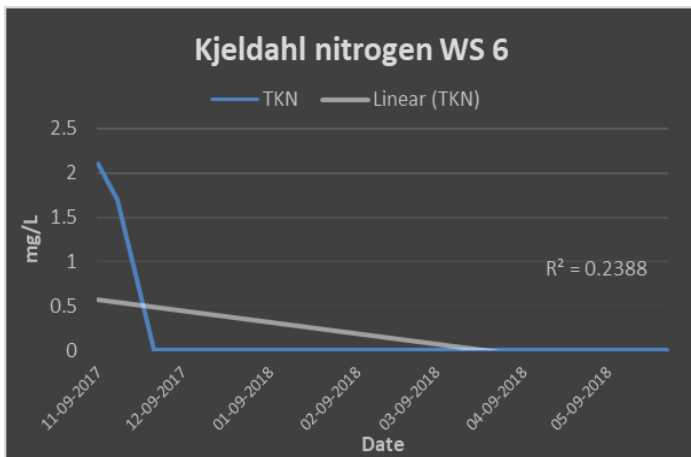


Figure 31. Kjeldahl nitrogen levels at WS 6 from November 2017 to May 2018.

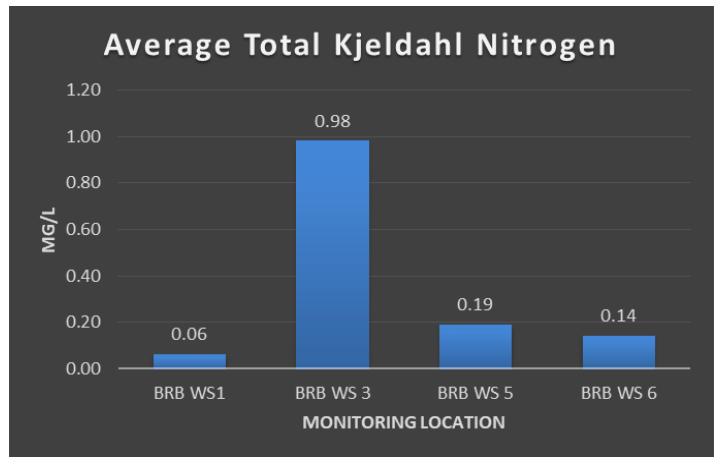


Figure 32. Average Kjeldahl nitrogen levels at all sample sites in FY 2018.

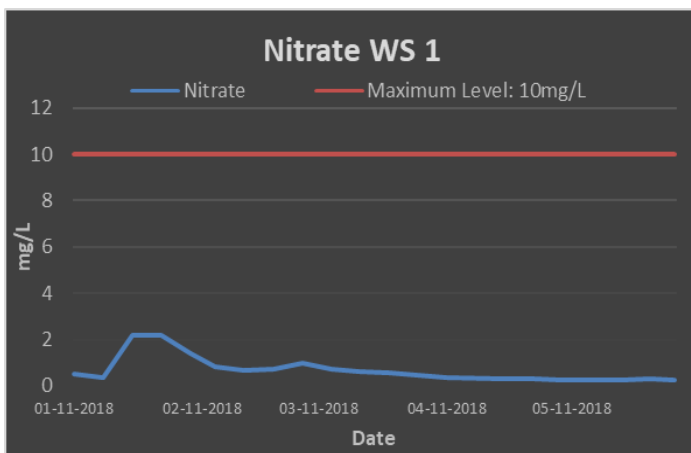


Figure 33. Nitrate levels for WS 1 from January 2018 to June 2018.

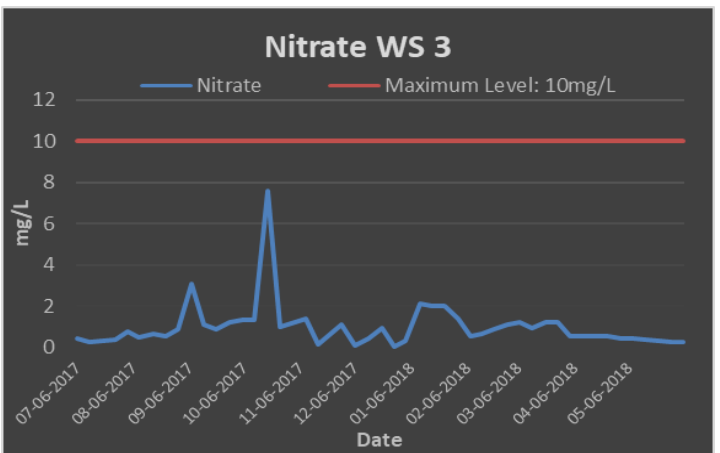


Figure 34. Nitrate levels for WS 3 from July 2017 to June 2018.

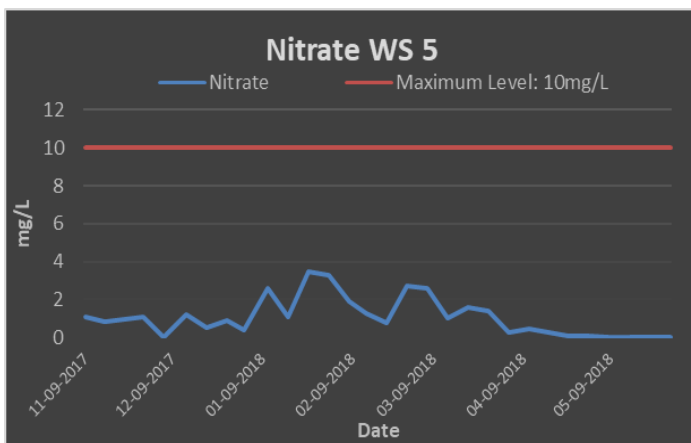


Figure 35. Nitrate levels for WS 5 from November 2017 to May 2018.

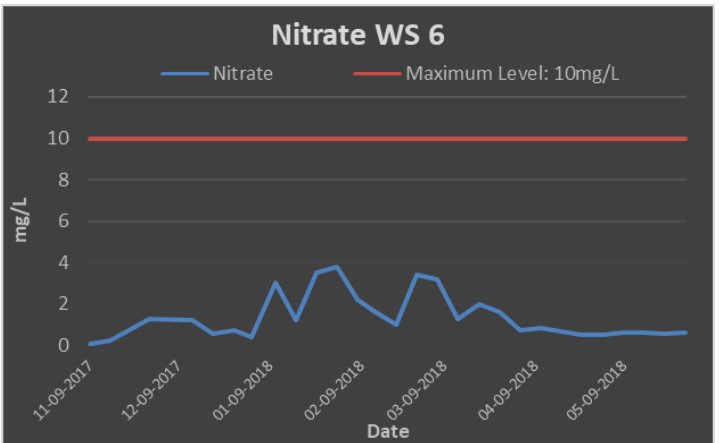


Figure 36. Nitrate levels for WS 6 from November 2017 to May 2018.

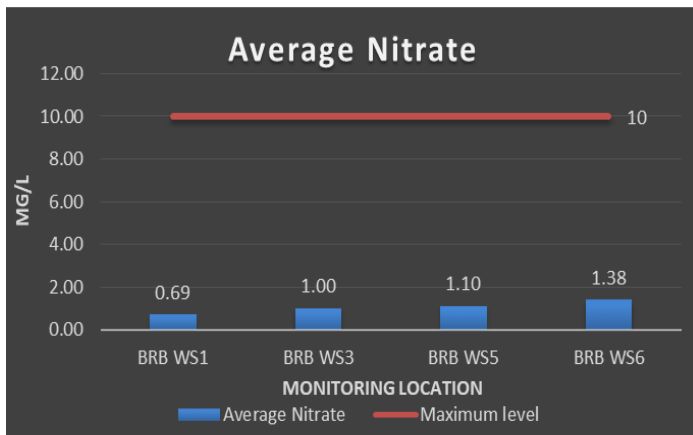


Figure 37. Average nitrate levels for all sample sites during FY 2018.

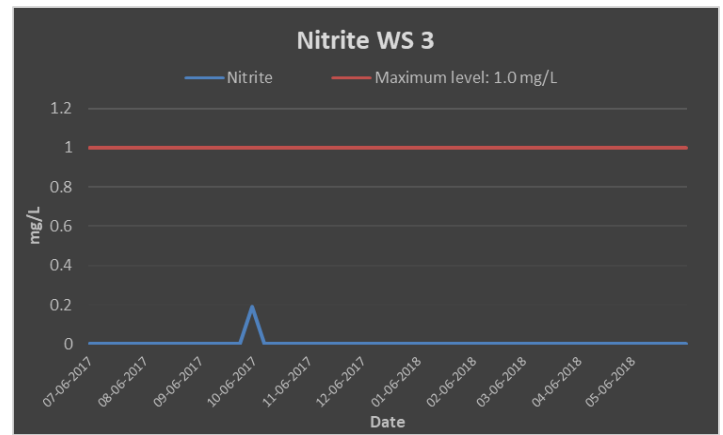


Figure 38. Nitrite levels for WS 3 from July 2017 to June 2018. This was the only sample site that had detectable nitrite.

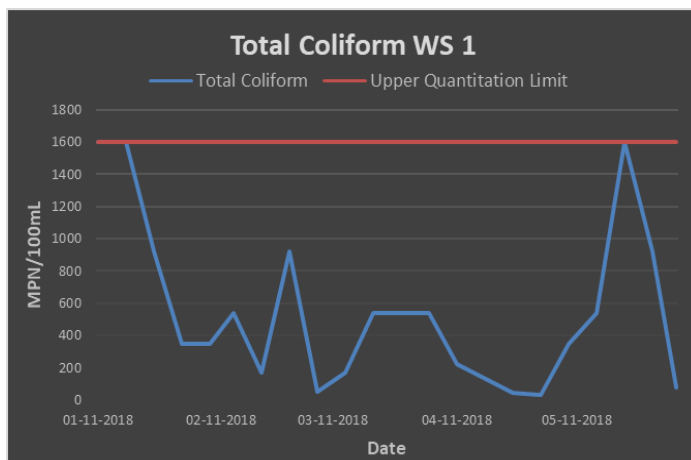


Figure 39. Total coliform in WS 1 from January 2018 to June 2018.

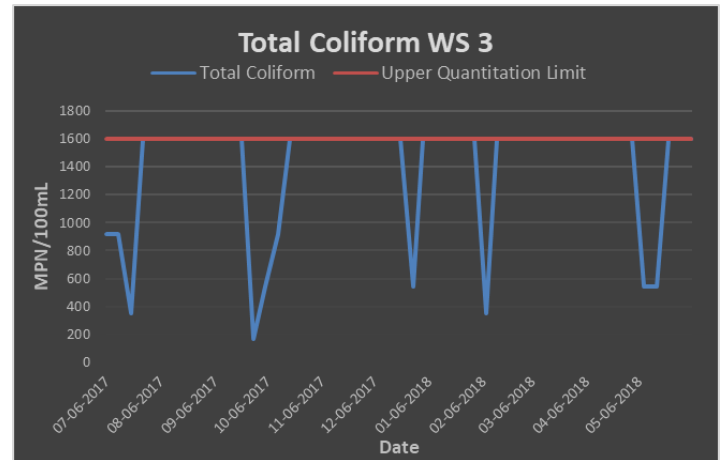


Figure 40. Total coliform in WS 3 from July 2017 to June 2018.

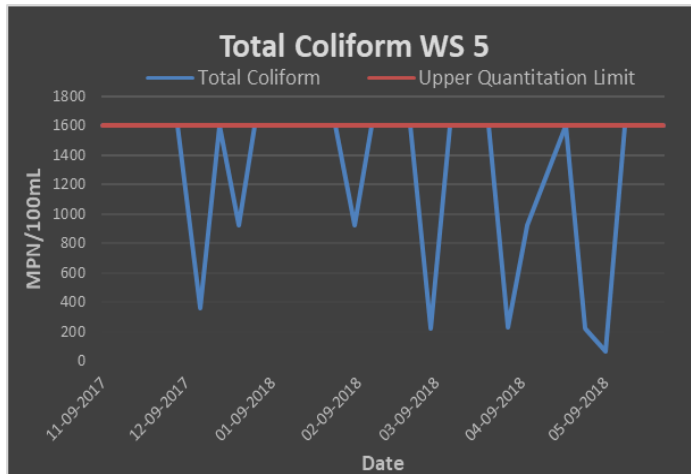


Figure 41. Total coliform in WS 5 from November 2017 to May 2018.

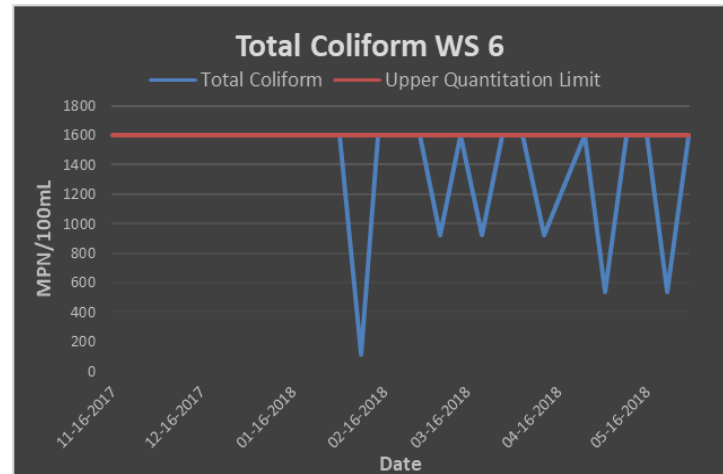


Figure 42. Total coliform in WS 6 from November 2017 to May 2018.

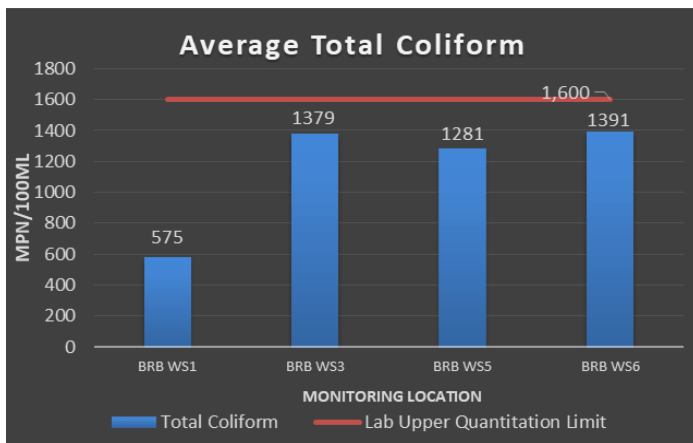


Figure 43. Average total coliform at all sample sites during FY 2018.

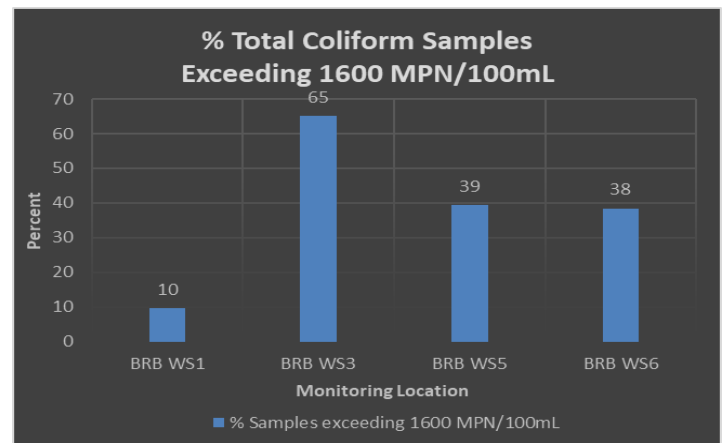


Figure 44. Percent of total samples that exceeded lab quantitation limit of 1600 MPN/100mL at all samples sites during FY 2018

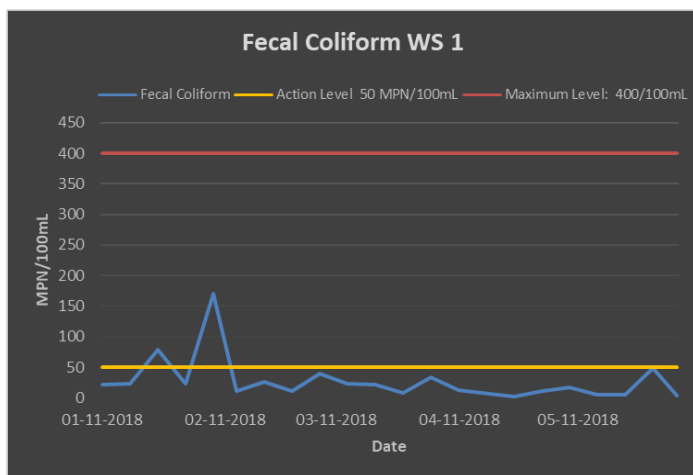


Figure 45. Fecal coliform at WS 1 from January 2018 to June 2018.

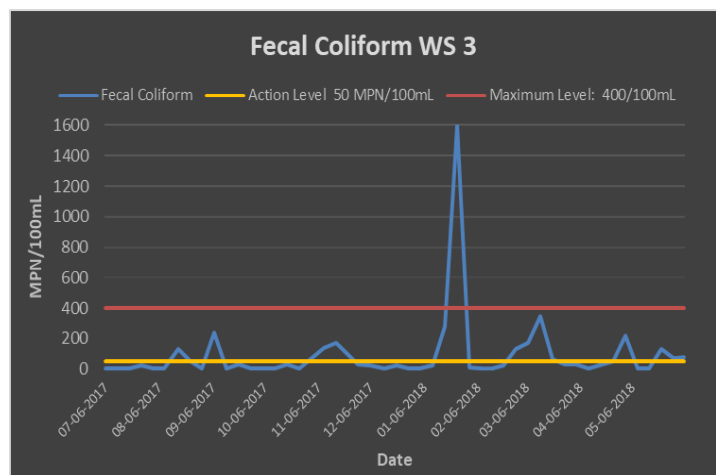


Figure 46. Fecal coliform at WS 3 from July 2017 to June 2018.

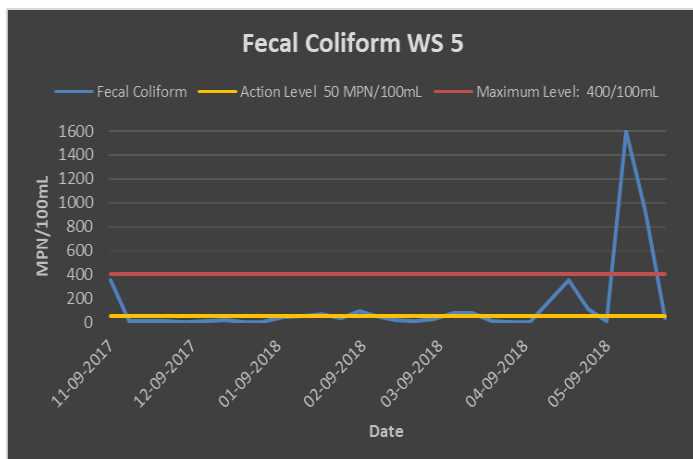


Figure 47. Fecal coliform at WS 5 from November 2017 to May 2018.

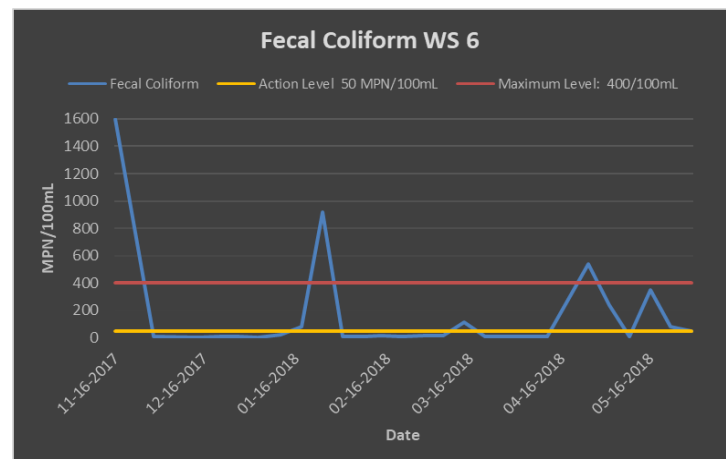


Figure 48. Fecal coliform at WS 6 from November 2017 to May 2018.

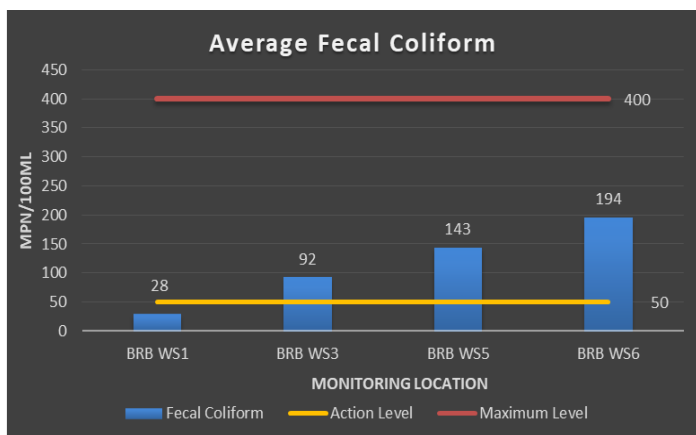


Figure 49. Average fecal coliform at all sample sites during FY 2018.

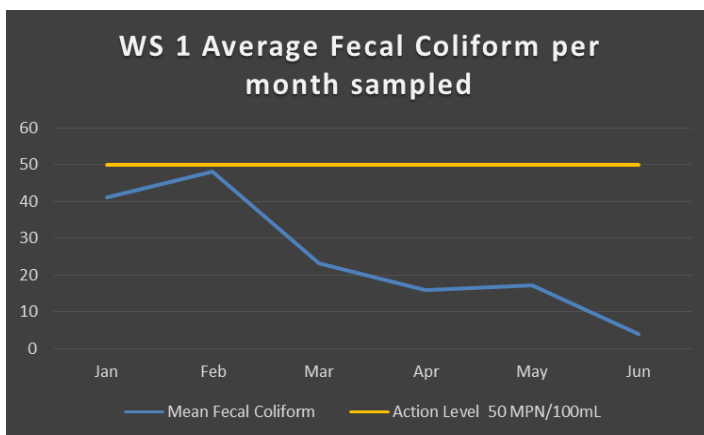


Figure 50. Average fecal coliform per month sampled at WS 1 from January 2018 to June 2018.

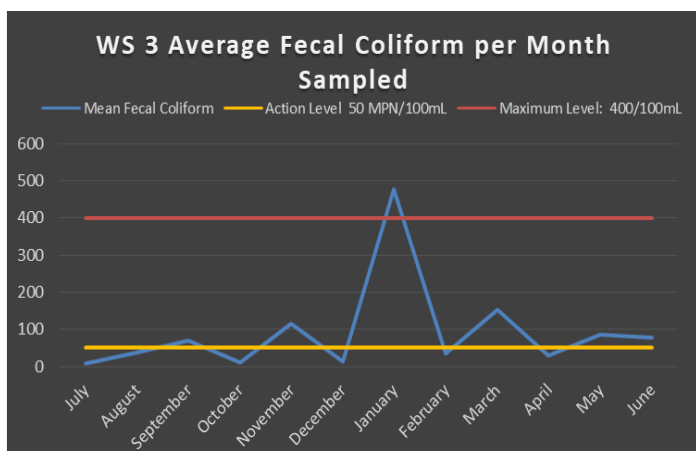


Figure 51. Average fecal coliform per month sampled at WS 3 from July 2017 to June 2018.

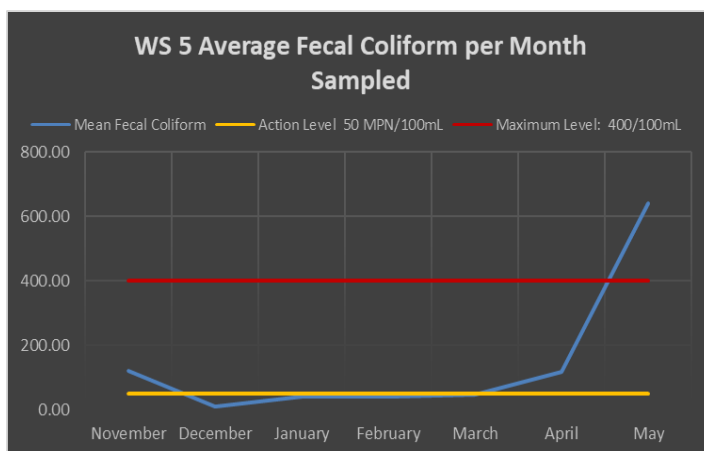


Figure 52. Average fecal coliform per month sampled at WS 5 from November 2017 to May 2018.

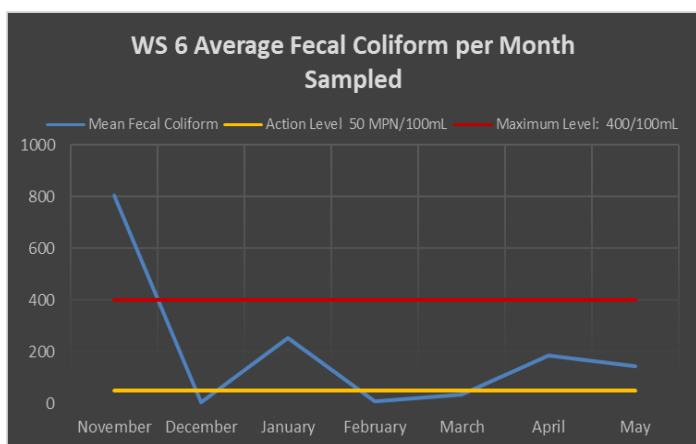


Figure 53. Average fecal coliform per month sampled at WS 6 from November 2017 to May 2018.

Table 1. WS 1 Fiscal year annual averages for all parameters tested in the years 2015 to 2018.

WS1		2015	2016	2017	2018
	WQ Criteria	Mean	Mean	Mean	Mean
Dissolved oxygen (DO) mg/L	>5	Not sampled	8.91	10.4	10.65
Fecal Coliform MPN/100mL	50 per 100 mL and no more than 10% of samples during a 30 day period exceed 400 per 100 mL	Not sampled	163.71	38.26	28
Kjeldahl nitrogen mg/L		Not sampled	1.71	0.36	0.06
Nitrate mg/L	10	Not sampled	1.16	0.79	0.69
pH	>6.5 , <8.5	Not sampled	5.71	6.30	6.42
Phosphate-phosphorus mg/L	no specific standard	Not sampled	0.071	0.050	0.031
Total Coliform MPN/100mL	10,000 per 100 mL	Not sampled	438.33	0	575
Total Nitrogen/Total Phosphorus Ratio (TN:TP) mg/L	no specific standard	Not sampled	2.99	0.8	0.37
Turbidity NTU	34.32	Not sampled	75.27	28.6	17.62
Nitrite mg/L	1.0	Not sampled	Not detected (ND)	ND	ND

Table 2. WS 3 Fiscal year annual averages for all parameters tested in the years 2015 to 2018.

WS3		2015	2016	2017	2018
	WQ Criteria	Mean	Mean	Mean	Mean
Dissolved oxygen (DO) mg/L	>5	9.9	8.96	8.96	9.63
Fecal Coliform MPN/100mL	50 per 100 mL and no more than 10% of samples during a 30 day period exceed 400 per 100 mL	157.7	117.86	145.34	92
Kjeldahl nitrogen mg/L	no specific standard	0.8	1.64	1.21	0.98
Nitrate mg/L	10	0.8	1.32	1.13	1
pH	>6.5 , <8.5	7.4	7.35	6.98	6.98
Phosphate-phosphorus mg/L	no specific standard	0.120	0.116	0.220	0.114
Total Coliform MPN/100mL	10,000 per 100 mL	950.12	1046.36	n/a	1379
Total Nitrogen/Total Phosphorus Ratio (TN:TP) mg/L	no specific standard	1.6	3.10	2.3	1.83
Turbidity NTU	85.2	55	33.37	71	43.96
Nitrite mg/L	1.0	ND	ND	0.002	0.004

Table 3. WS 5 Fiscal year annual averages for all parameters tested in the years 2015 to 2018.

WS5		2015	2016	2017	2018
	WQ Criteria	Mean	Mean	Mean	Mean
Dissolved oxygen (DO) mg/L	>5	9.2	8.36	9.26	9.72
Fecal Coliform MPN/100mL	50 per 100 mL and no more than 10% of samples during a 30 day period exceed 400 per 100 mL	193.6	143.17	89.44	143
Kjeldahl nitrogen mg/L	no specific standard	0.5	1.41	0.27	0.19
Nitrate mg/L	10	0.5	1.01	1.30	1.1
pH	>6.5, <8.5	7.2	7.16	6.92	6.74
Phosphate-phosphorus mg/L	no specific standard	0.070	0.062	0.070	0.034
Total Coliform MPN/100mL	10,000 per 100 mL	796.24	640.99	n/a	1281
Total Nitrogen/Total Phosphorus Ratio (TN:TP) mg/L	no specific standard	0.84	2.30	1.40	1.21
Turbidity NTU	9.36	21.4	11.09	7.80	9.57
Nitrite mg/L	1.0	ND	ND	ND	ND

Table 4. WS 6 Fiscal year annual averages for all parameters tested in the years 2015 to 2018.

WS6		2015	2016	2017	2018
	WQ Criteria	Mean	Mean	Mean	Mean
Dissolved oxygen (DO) mg/L	>5	8.5	8.49	9.55	11.14
Fecal Coliform MPN/100mL	50 per 100 mL and no more than 10% of samples during a 30 day period exceed 400 per 100 mL	38	100.46	111.47	194
Kjeldahl nitrogen mg/L	no specific standard	0.6	1.21	0.22	0.14
Nitrate mg/L	10	0.5	0.84	1.67	1.38
pH	>6.5, <8.5	7.2	7.07	6.93	6.86
Phosphate-phosphorus mg/L	no specific standard	0.050	0.058	0.060	0.052
Total Coliform MPN/100mL	10,000 per 100 mL	684.96	651.79	n/a	1391
Total Nitrogen/Total Phosphorus Ratio (TN:TP) mg/L	no specific standard	0.83	2.18	1.68	1.3
Turbidity NTU	12.6	5.01	3.94	10.5	14.54
Nitrite mg/L	1.0	ND	ND	ND	ND

## **a. Summary of our program findings**

### ***Dissolved Oxygen***

Dissolved oxygen (DO) levels maintained levels above 5 mg/L throughout the sampling year for all sampling sites (figures 1-4). Average DO at WS1 was 10.65mg/L, WS 3 was 9.63mg/L, WS5 was 9.72mg/L, and average DO at WS6 was 11.14mg/L (figure 5). The lowest DO levels took place in summer and fall which follows typical seasonal fluctuation, yet the lowest levels were not below the minimum threshold of 5 mg/L. All sampling sites maintained healthy DO levels throughout the sampling season (figures 1-5). Annual average DO for all sample sites remained healthy and compared with past data either remained constant or had increased (tables 1-4).

### ***pH***

pH levels fluctuated throughout the sampling season and varied across all sample sites with WS 1, and WS 6 dipping below the minimum pH levels on several occasions. WS 3 and WS 5 maintained overall healthy pH levels, and the yearly average pH was well within healthy ranges with the exception of WS1 (figures 6-10). WS1 had 56 percent of its samples below the minimum pH of 6.5. WS 6 had 17 percent of samples below the minimum pH, WS 3 had 2 percent of samples below the minimum pH, and WS 5 had 0 percent of its samples below the minimum pH level (figure 11). WS 3, 5, and 6 are all located within the same subbasin called middle creek. WS 1 is located in a different sub basin known as eastern creek. Annual pH averages for WS1 have improved since 2016 (table 1), while pH averages for WS 3, 5, and 6 have remained relatively stable (tables 2-4).

### ***Turbidity***

Turbidity results varied across all sample sites. WS 1 had relatively low turbidity levels and had no instances where turbidity was measured above the maximum level of 49 NTU. WS 3 did record levels above its maximum level of 59 NTU 22 percent of the time. WS 5 stayed well under its maximum level of 10 NTU with a few exceptions, 14 percent of the samples taken at WS 5 were above 10 NTU. 41 percent of samples from WS 6 measured above its maximum level of 12 NTU (figures 12-17). The annual averages for WS 1, 3, and 5 all fell below the maximum level respectively, while annual average turbidity at WS 6 was above the maximum level (figure 16). Compared to historic data the annual averages for WS 1, 3, and 5 have all declined since 2015, while WS 6 has increased (tables 1-4).

### ***Total Nitrogen***

Annual average total nitrogen at WS 1 was .37 mg/L, at WS 3 it was 1.83mg/L, as WS 5 it was 1.21mg/L and annual average total nitrogen was 1.30mg/L at WS 6 (figure 22). See figures 18-21 for total nitrogen levels for all sampling sites. Total nitrogen levels were highest in WS 3 (figure 19). Compared to historic data, average total nitrogen levels at WS1 have been decreasing, while WS 3,5, and 6 indicate a minor increase in Total nitrogen since 2015. Annual averages for WS 1, 3, 5, and 6 indicated decreasing levels of total nitrogen since 2015 (tables 1-4).

### ***Phosphate-phosphorus***

Phosphate-phosphorus levels were highest in WS 3, however there were spikes of phosphate-phosphorus in WS 1, 5, and 6 (figures 23-26). Average annual phosphate at WS 1 was 0.031mg/L, at WS 3 it was 0.114mg/L, at WS 5 it was 0.034mg/L, and 0.052mg/L at WS 6 (figure 27). Compared to historic data, phosphate-phosphorus levels have been decreasing for all sample sites (tables 1-4).

### ***Kjeldahl nitrogen***

Total Kjeldahl nitrogen (TKN) levels were highest and most frequent in WS 3 (figure 28) WS 1, 5, and 6 had infrequent TKN readings (figures 29-31). Average TKN was 0.06mg/L at WS1, 0.98 mg/L at WS 3, 0.19 mg/L at WS 5, and 0.14mg/L at WS 6 (figure 32). Compared to historic data TKN levels have been decreasing at all sample sites (tables 1-4).

### ***Nitrate***

Nitrate levels for all samples sites were below the maximum level of 10 mg/L (figures 33 -36). Generally nitrate levels in WS 3, 5, and 6 are highest between January through March, while WS 1 had its highest levels in late January early February (figures 33-36). Average nitrate was 0.69 mg/L at WS 1, 1.00mg/L at WS 3, 1.10mg/L at WS 5, and 1.38 mg/L at WS 6 (figure 37). Compared to historic data, average nitrate levels at WS 1 have been decreasing (table 1), while average nitrate levels at WS 3, 5, and 6 have increased (tables 2, 3, 4).

### ***Nitrite***

Nitrite is rarely observed in the Rancheria's dataset. WS 3 was the only site to detect any levels of nitrite in FY 2018. Nitrite was observed on October 5, 2017 at .019mg/L which falls below the maximum level of 1.0mg/L (figure 38). The average annual levels of nitrite in WS 3 increased in 2018 (table 2).

### ***Total Coliform***

Total coliform varied greatly at each sample site. Though it appears that all sites were well under the action level of 10,000 MPN/100mL set by the Rancheria (figures 39-42), North coast laboratory has a quantitation limit of 1600MPN/100mL, therefore making it impossible to know if samples exceed water quality standards. The laboratory quantitation limit was exceeded by all sites during the sampling year. 10 percent of samples taken at WS 1 exceeded the laboratory quantitation limit of 1600 MPN/mL, 65 percent of samples at WS 3 exceeded the quantitation limit, 39 percent of samples at WS 5 exceeded the quantitation limit, and 38 percent of samples at WS 6 exceeded the upper quantitation limit (figure 44). Annual averages for total coliform at each site, however, were all below the upper quantitation limit (figure 43). Compared to historical data all sample sites indicate an increase of total coliform presence since 2015 (tables 1-4).

### ***Fecal Coliform***

Fecal coliform was present in all sample sites throughout the sampling year, and presence of fecal coliform did exceed standards at certain times of the year at WS 3, 5, and 6, but WS 1 did not exceed water quality standards (figures 45-49). Water quality standards are exceeded when there is fecal coliform present above the action level of 50/100mL and no more than 10 percent of samples in a 30 day period exceed the maximum level of 400/100mL. If one sample is above 400/100mL in a 30 period than the action level has been reached for that month. Average fecal coliform at WS1 was 28/100mL and saw no fecal coliform above action levels (figures 45, 50). Average fecal coliform at WS 3 was 92/100mL and there was one instance in January where fecal coliform was present above action levels. Fecal coliform was measured at >1600/100mL (present above lab quantitation limits) on January 25, 2018 (figures 46, 51). Average fecal coliform at WS 5 was 143/100mL and there were two instances in May where fecal coliform was present above action levels. Fecal coliform was measured at 1600/100mL on May 16, 2018 and 920/100mL on May 23, 2018 (figures 47, 52). Average fecal coliform at WS 6 was 194/100mL and there were three instances where fecal coliform was present above action levels. Fecal coliform was measured at >1600/100mL (present above lab

quantification limits) on November 16, 2017, at 920/100mL on January 25, 2018, and 540/100mL on April 25, 2018 (figures 48, 53).

#### **i. Impairments to water bodies**

##### ***DO impairments***

There are no sampling sites with impairments to dissolved oxygen in the FY 2018 sampling year.

##### ***pH impairments***

WS1 indicates to have low pH or water that is more acidic than what Bear River's standards require (standards require that pH be maintained between 6.5 and 8.5). This impairment was reported in 2016 and 2017 annual reports. WS 1 is located in a different sub basin known as eastern creek. The sample site is high in the sub basin and is surrounded by dense mixed hardwood and conifer riparian forest. The cause for low pH (acidic water) is unknown, however the site may have naturally occurring low pH due to the fir and pine trees surrounding it which contribute to the formation of more acidic organic matter in the soil (USU extension, 2014). Low pH may also have some other human caused impacts from upstream agriculture runoff, however there is no direct evidence of this. The lowest pH readings occurred in January, when water was returning to the stream and June when the water began to dry up from the stream, understanding the low pH trend will require more in depth studies of this water body.

Since geology and soil can affect pH of a stream it could be useful to determine if the underlying rock type and conduct pH testing of the surrounding soil to better understand if natural factors are affecting the stream's pH (Reid, 2009, Mesner and Geiger, 2010). It may be helpful to look upstream and upslope for pollution sources to help identify any pollutants affecting pH, this would include possible subsurface, and surface pollutants. More consistent long term monitoring of the pH of WS1, and eastern creek as a whole, can bolster our understanding of this system.

WS 6 also indicates pH levels below the minimum level of 6.5. These instances were followed by a rebound to healthy pH levels and do not indicate that the system as a whole suffers from low pH. The cause of these instances of low pH are unknown, but may be attributed to excess nutrients, or the presence of stormwater runoff pollutants such as chromium, nickel, zinc, and lead which appear in low levels on the Rancheria (Fondriest, 2013, Mesner and Geiger, 2010). It would be useful to determine if and where upstream pollutants are entering the stream. It is likely that these contaminants are coming from the casino parking lot which is located at the headwaters of middle creek. Installing a bioswale or filtration strip to filter runoff prior to it draining down into the Singly road culvert could help prevent excess pollutants from entering the wetlands. Also ensuring that BMPs are enacted on all construction projects taking place on the Rancheria will help ensure construction byproducts and waste do not end up in the wetlands via stormwater runoff.

##### ***Turbidity impairments***

Water quality standards at Bear River Rancheria require that turbidity is no more than 20% above natural background levels. The maximum levels for each sample site varies and is 20% of the combined historic averages for the sample site. WS 3, WS 5, and WS 6 have consistently high turbidity levels and exceeded the action level several times over the course of the sampling

period. The number of samples exceeding the action level at WS1 has reduced since 2016, in fact in 2018 there were no exceedances of turbidity at WS1. The number of samples exceeding the action level at WS3 decreased compared with 2017 but had more exceedances than 2016. WS5 saw less exceedances than both 2017 and 2016 sampling period, while the number of samples exceeding action levels at WS 6 was higher than in 2016 and 2017 (table 1-4). WS 3, 5, and 6 are all located in the middle creek sub basin and should be monitored for impairment of turbidity. Generally, the ongoing turbidity impairment of middle creek area is likely due to stormwater runoff and non point source pollutants likely stemming from parking lots, roads, construction zones, residential areas, and nearby agriculture activities. WS 6, however does have an active erosion issue on river left just upstream of the sampling site. The soil is slumping and eroding downslope of a stormwater outlet culvert near the waste water treatment driveway. Seeking corrective action for this erosion issue may help alleviate turbidity issues at WS6. Continuing to implement BMPs and addressing the runoff from the casino parking lot could help prevent continued turbidity impairments.

#### ***Total nitrogen impairments***

No direct standards are available for determining impairments of nitrogen. Average total nitrogen levels have been decreasing since 2016 at all wetland sampling sites, which indicates that water quality has not further degraded and shows improvement.

#### ***Phosphate-phosphorus impairments***

No direct standards are available for determining impairments of phosphorous/phosphate. Yearly comparisons of average phosphate-phosphorus levels have been decreasing at WS1, WS3, and WS5 since 2016, which indicates that water quality has not further degraded in those sites. WS 6 levels show minimal fluctuation up or down indicating that little change has occurred in this sample site.

#### ***Total Kjeldhal nitrogen (TKN) impairments***

No direct standards are available for determining impairments of TKN. Yearly comparisons of annual averages indicated that there is an overall less TKN being measured at all sample sites (tables 1-4), which indicates that water quality has not further degraded at those sites.

#### ***Nitrate impairments***

No nitrate impairments to water bodies in FY 2018. Yearly comparisons of annual averages indicate an improvement in nitrate levels at WS 1 since 2015, minimal change in water quality at WS3 since 2015, and possible further degradation of water quality in both WS 5 and WS6 since 2015 (tables 1-4).

#### ***Nitrite impairments***

No nitrite impairments to water bodies in FY 2018, however, the number of nitrite levels year to year has increased at WS 3 since 2015 (table 2).

#### ***Total coliform impairments***

Coliform is present at all sampling sites. It is challenging to determine if there is a coliform impairment as the upper quantitation limit of North Coast Laboratory is 1600/100ml and our

water quality standards allow up to 10,000/100mL. Therefore I cannot quantify the results from the lab that read “present above the quantification limit.” Moreover, greater than half the samples at WS 3 indicated high levels of total coliform and indicate a possible impairment. All samples sites have higher annual averages for total coliform in 2018 compared to values since 2015, (tables1-4) therefore it seems likely that further degradation of water quality from total coliform has occurred.

#### ***Fecal coliform impairments***

Fecal coliform impairments are present at WS3, WS5, and WS6. Yearly annual average comparisons indicate that water quality over time has not further degraded at WS1, WS3 or WS5, however water quality has further degraded at WS 6 (tables 1-4).

Fecal coliform impairments are caused by non-point sources likely from high populations of domestic pets and stray cats on the Rancheria, wildlife, and neighboring cattle grazing.

- ii. **Trends:** We are able to track trends with the water quality data that has been collected over the years.
- iii. **Summary statistics:** We use averages of contaminants of concern and we show this using a combination of bar graphs and lines graphs. This data is also measured against Water Quality Standards and analyzed for trends during the monitoring period. Yearly annual average data is also charted in tables and graphed with trend lines to help determine trends in water quality over the years (see section 7 for figures and tables).
- iv. **Changes to Water Quality program:** After interpreting our results, we will continue monitoring at a frequency of twice per month and we will continue following our QAPP protocol. Continued sampling is necessary to determine the condition of surface water quality on the Rancheria and to help inform future strategies that may improve water quality.
  - 1. We do plan to begin incorporating bioassessments into our monitoring. We wish to use macroinvertebrates as another way to examine water quality conditions.

#### **b. Water Quality issues of concern**

- i. High presence of fecal coliform, low pH values, trash in wetlands, and pollutants from stormwater runoff continue to be issues of concern for the Tribe. We seek to reduce non point source pollutants to increase overall water quality in our streams. It is also a priority to maintain healthy wetland and stream ecosystems with native plants and animals by managing invasive species and minimizing disturbance from human activity.

## 8. Stormwater Sampling Results

Note there were no detections for hydrocarbons on March 7, 2018 at SS2 and SS4, and no detections of nitrite in any of the stormwater samples taken on March 7<sup>th</sup> or April 11, 2018.

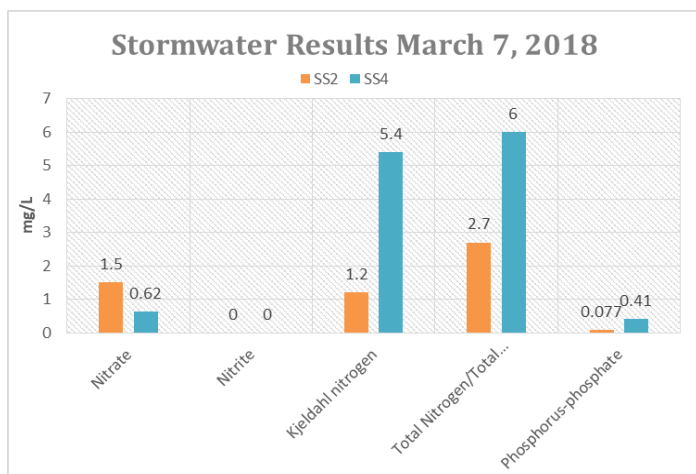


Figure 54. Nutrient levels at SS2 and SS4 on 3/7/2018. Note: Values shown as zero on graph are reported as "Not Detected."

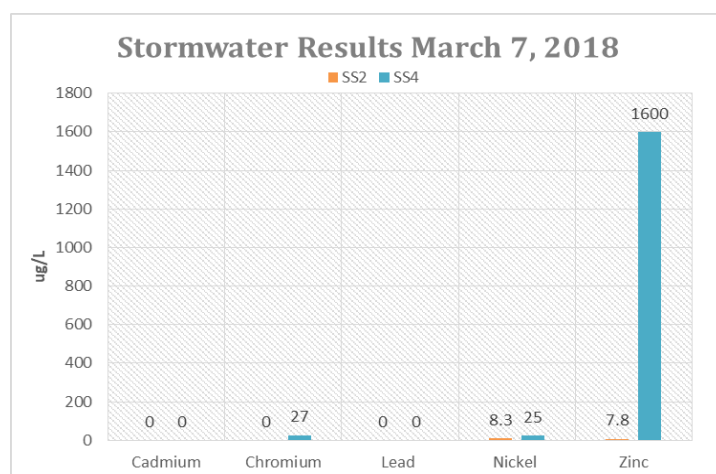


Figure 55. Levels for various metals at SS2 and SS4 on 3/7/2018. Note: Values shown as zero on graph are reported as "Not Detected."

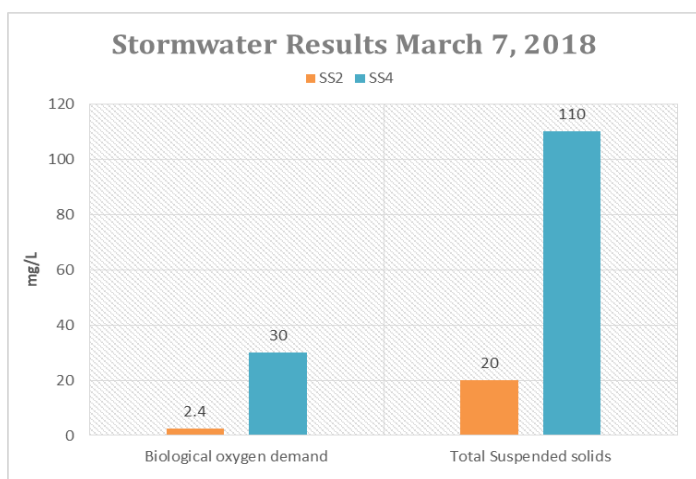


Figure 56. BOD and TSS levels at SS2 and SS4 on 3/7/2018.

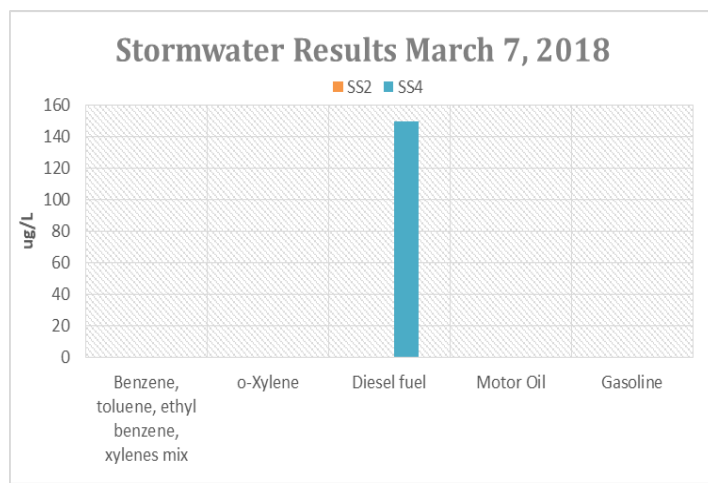


Figure 57. BTEX, and total Petroleum Hydrocarbon levels at SS2 and SS4 on 3/7/2018. Note: Values shown as zero on graph are reported as "Not Detected."

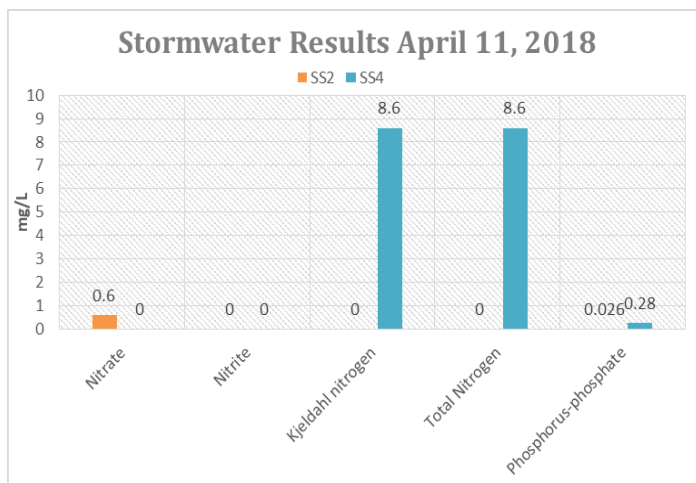


Figure 58. Nutrient levels at SS2 and SS4 on 4/11/2018. Note: Values shown as zero on graph are reported as "Not Detected."

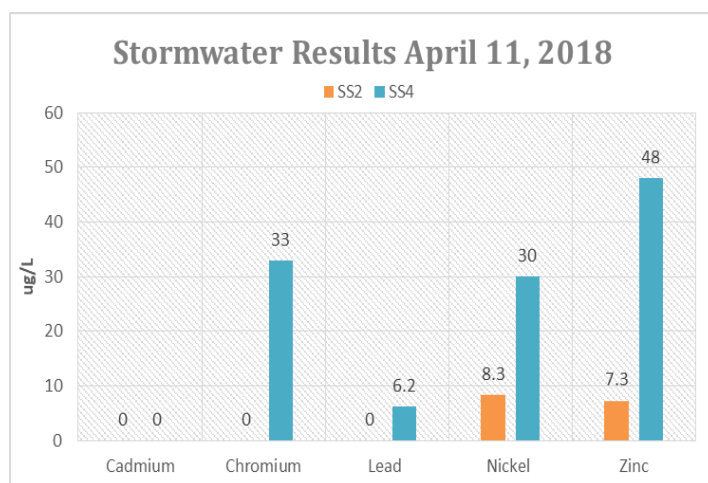


Figure 59. Levels for various metals at SS2 and SS4 on 4/11/2018. Note: Values shown as zero on graph are reported as "Not Detected."

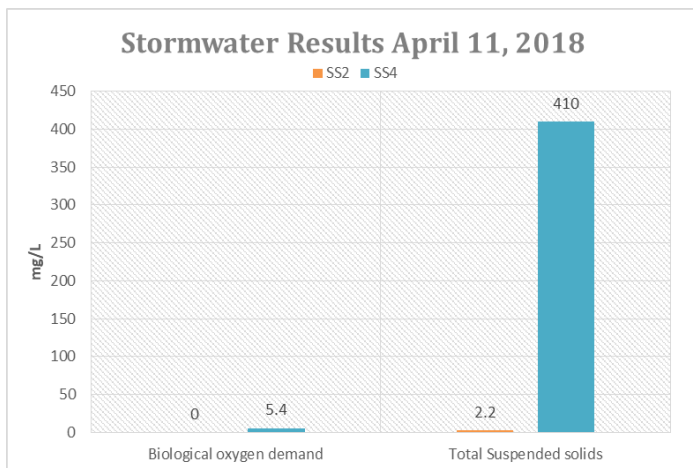


Figure 60. BOD and TSS levels at SS2 and SS4 on 4/11/2018. Note: Values shown as zero on graph are reported as "Not Detected."

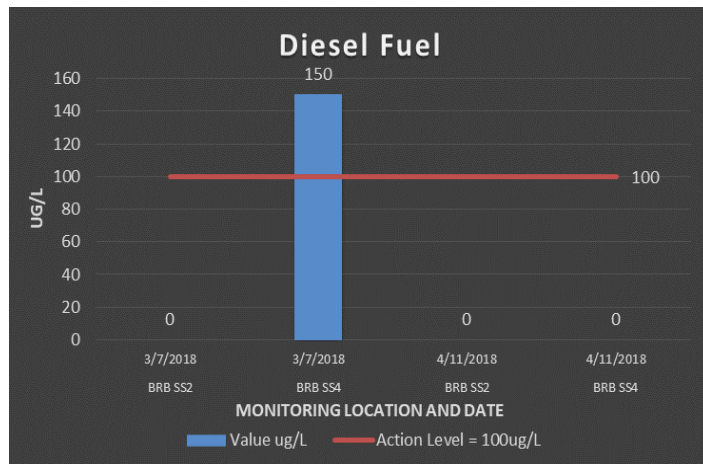


Figure 61. Diesel fuel levels in stormwater graphed against stormwater quality standard action levels. Values shown as zero on graph are reported as "Not Detected."

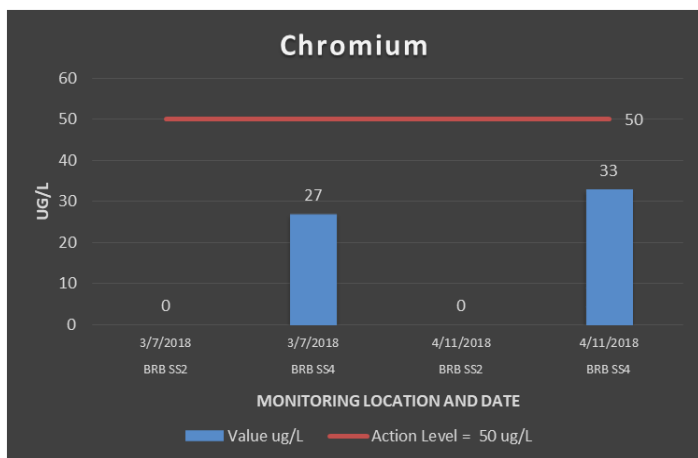


Figure 62. Chromium levels in stormwater graphed against stormwater quality standard action levels. Values shown as zero on graph are reported as "Not Detected."

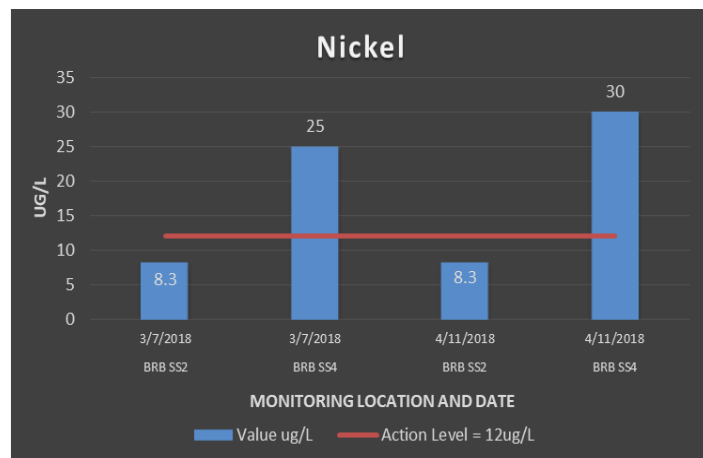


Figure 63. Nickel levels in stormwater graphed against stormwater quality standard action levels.

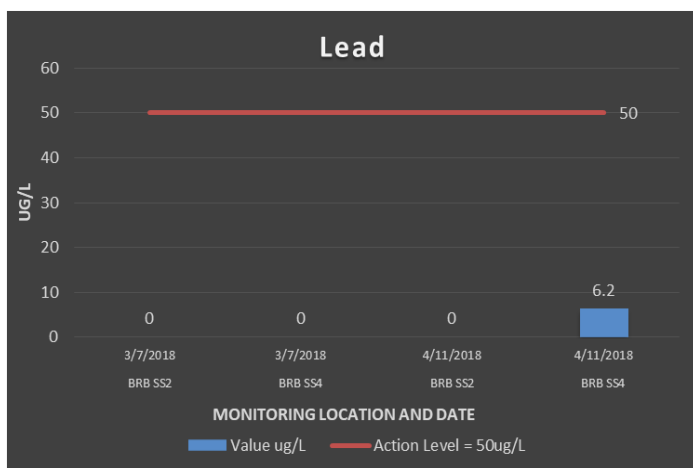


Figure 64. Lead levels in stormwater graphed against stormwater quality standard action levels. Values shown as zero on graph are reported as "Not Detected."

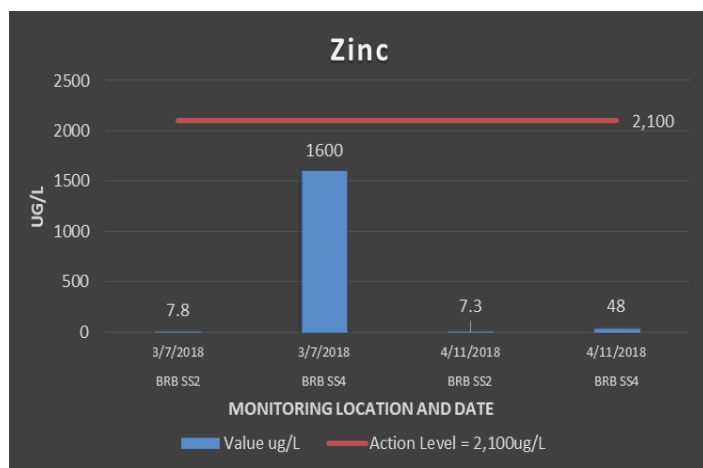


Figure 65. Zinc levels in stormwater graphed against stormwater quality standard action levels.

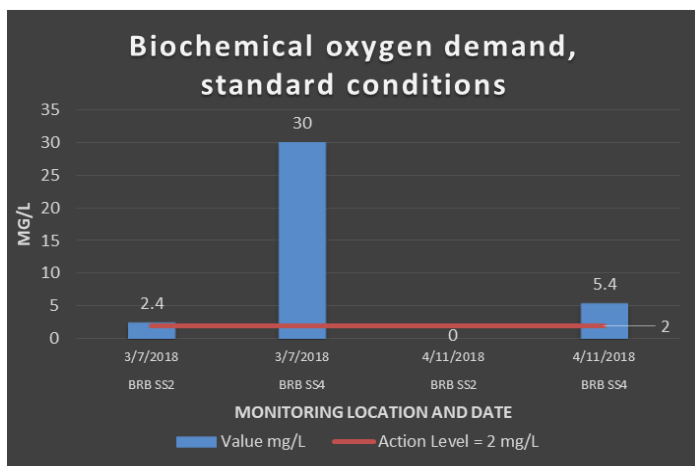


Figure 66. Biological oxygen demand in stormwater graphed against stormwater quality standard action levels. Values shown as zero on graph are reported as “Not Detected.”

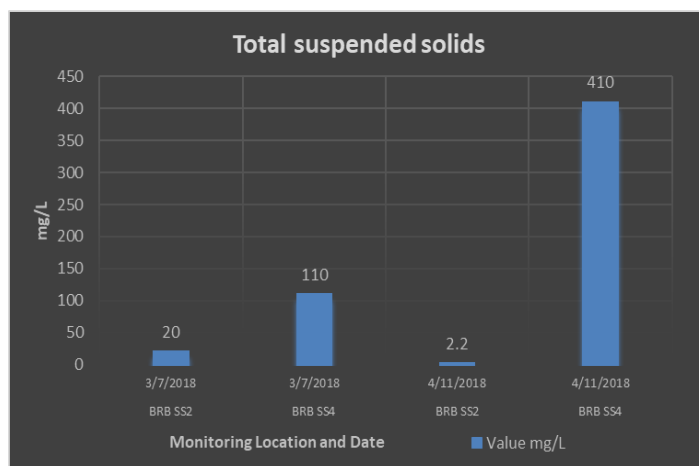


Figure 67. Total suspended solids present in stormwater samples. Water Quality standards state that waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

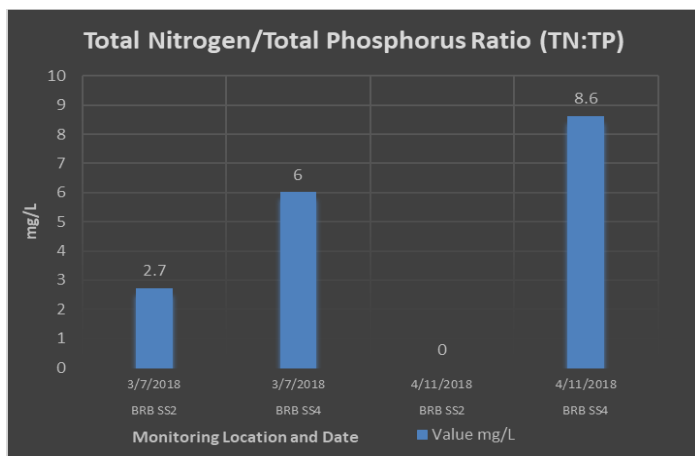


Figure 68. Total nitrogen levels present in stormwater samples. There are no direct water quality standards for total nitrogen. Values shown as zero on graph are reported as “Not Detected.”

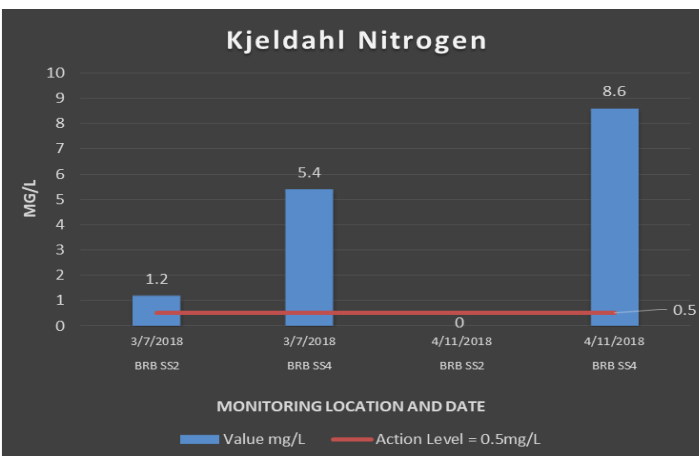


Figure 69. Kjeldahl nitrogen levels in stormwater graphed against stormwater quality standards. Values shown as zero on graph are reported as “Not Detected.”

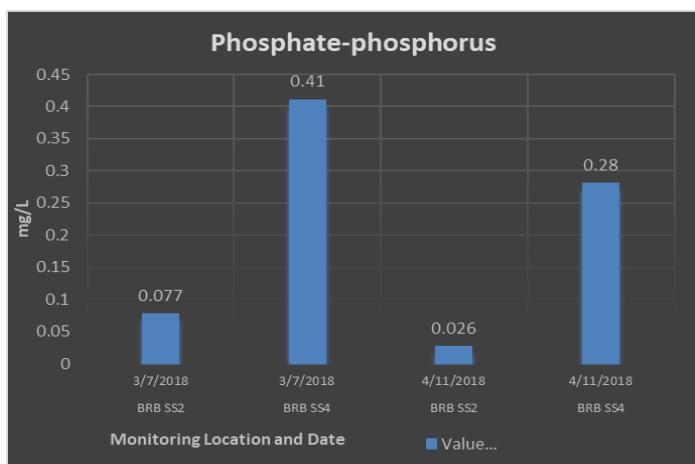


Figure 70. Total phosphate – phosphorus levels present in stormwater samples. There are no direct water quality standards for phosphate - phosphorus.

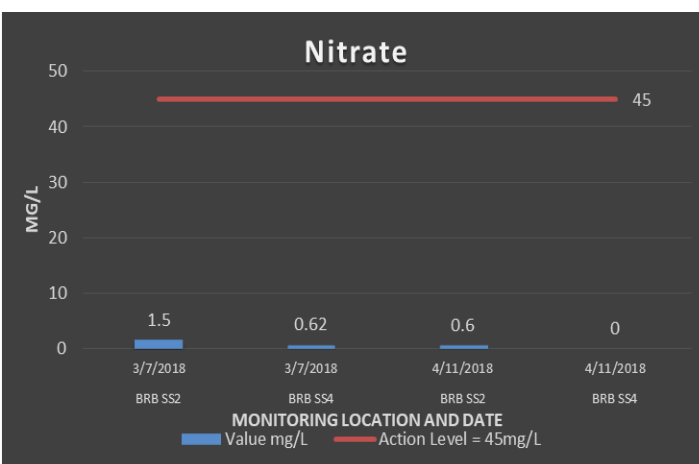


Figure 71. Nitrate levels in stormwater graphed against stormwater quality standards. Values shown as zero on graph are reported as “Not Detected.”

a. **Stormwater Sampling Summary**

During the FY 2018 there were many storm events, but only two qualifying storm events occurred that the WQS was able to sample. Bear River Rancheria's 2018 QAPP describes a qualifying storm event as follows: (1) storm event must be greater than 0.1 inches in magnitude, (2) storm must occur at least 72 hours from the previously measurable storm event, and (3) samples must be collected during the first 30 minutes of the discharge.

Samples were collected from SS2 and SS4 on March 7, 2018, and April 11, 2018. SS2 receives runoff from the Bear River Casino and Hotel parking lot and surrounding neighborhood on Bear River Drive. SS4 receives runoff from the north end of Carroll road in the Tish Non Village.

Nitrate, total nitrogen, and phosphorus-phosphate were detected in stormwater samples, but none were present at levels above water quality standards (figures 54, 58, 68,70,71). Kjeldahl nitrogen was detected above water quality standards at both SS2 and SS4 on March 7, 2018 and only at SS4 on April 11, 2018 (figure 69).

Chromium, lead, and zinc were all detected in stormwater samples, but none were present above water quality standards (figures 55, 59, 65). Chromium was detected only at SS4 (figure 62) and lead was only detected at SS4 on April 11, 2018 (figure 64). Nickel was detected at both SS2 and SS4 on both sampling occasions. SS4 saw levels of nickel above the action level (figure 63).

Diesel fuel was detected at 150 µg/L at SS4 on March 7, 2018, which is above the action level of 100 µg/L. Other petroleum hydrocarbons tested were not detected (figure 57, 61).

Total suspended solids (TSS) were detected at both sites on both sampling occasions (figures 56, 60). SS4 saw higher levels of TSS present in the water compared to SS2 which had low levels (figure 67). Water quality standards state that waters shall not contain suspended material in concentrations that may cause nuisance or adversely affect beneficial uses. When compared to turbidity levels for both stormwater sample events, turbidity levels remained under the action levels on March 7<sup>th</sup>, 2018, however middle creek did see turbidity levels higher than action levels on April 11, 2018 (figures 13,14,15). Despite high turbidity and TSS, beneficial uses likely went unimpacted from these storm events as the stream immediately cleared up after the storm.

Biological oxygen demand (BOD) was detected and was above water quality standard action level with the exception of SS 2 on April 11, 2018 where BOD went undetected (figure 56). On March 7, 2019 SS4 saw a BOD of 30mg/L, well over the 2mg/L action level (figure 66). BOD measures the amount of dissolved oxygen (DO) used by aerobic microorganisms decomposing organic matter in water. The high BOD level indicates a high level of nutrients (phosphorus, nitrogen, sewage, or animal feces) in the water that then feeds microorganisms. As microorganisms feed on nutrients and organic matter they use up oxygen which, in turn, reduces the dissolved oxygen available to support invertebrates, amphibians, and fish living in the water. Despite the indication of high BOD, DO levels in middle creek were not impacted and remained above the minimum level of 5mg/L.

**b. Conclusions**

The Bear River Casino and Hotel parking lot remains to be a source of stormwater pollution as SS4 indicates with its high levels of diesel, BOD, Nickel, nutrients and TSS. Implementing a bioswale or infiltration strip to increase stormwater filtration prior to runoff entering the single hill culvert, which leads to the wetland, may help reduce the impacts of urban stormwater runoff. This would require reconstructing a portion of the parking lot, but given that the parking lot is essentially the headwaters of middle creek and subsequent wetland complex it may be worth implementing such a project in order to improve water quality. Continued monitoring will help determine the composition of stormwater and help determine if BMPs, LIDs are needed or are helping to mitigate stormwater impacts on water quality.

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